The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. LIV
No. 1395

SATURDAY, MARCH 23, 1946
REGISTERED AS A NEWSPAPER

6D. PER COPY
POST FREE 8D.

DUNLOP

HIGH PRESSURE HOSE ASSEMBLY

Approved for working pressures up to 3,000 lb./sq. in. Suitable for Air, Hydraulic Fluids, Engine Oil, Petrol, Glycol, Chemical Fluids, etc.

If you have any problems regarding flexible Hose Assemblies, write to our Technical Dept. (E), Foleshill, Coventry.

DUNLOP RUBBER Co. Ltd., FOLESHILL, COVENTRY

6H/907

SHUTTER VENTILATION

for instant clearance of

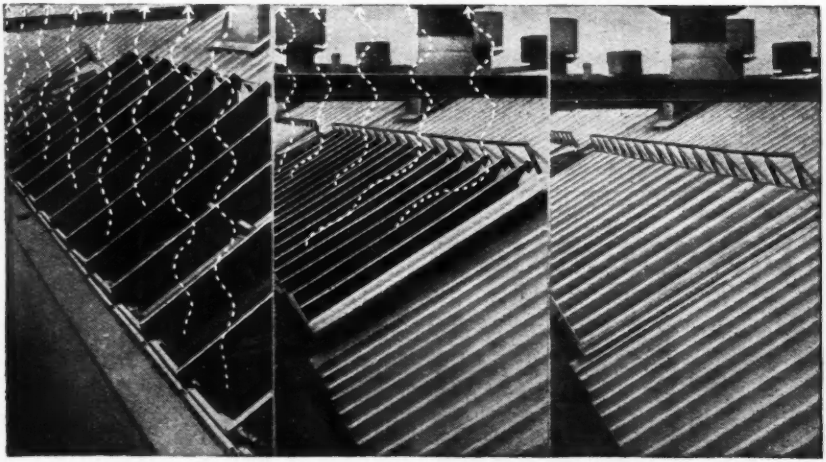
FUMES AND SMOKE

from Foundries, Retort Houses, Furnace Buildings, etc., etc.

The Shutters provide what is in effect a moveable roof to the building which, by means of steel louvres in themselves forming extraction vanes, create extraction draught. The louvres are formed on both sides of a centrally operated dual gear unit; each side can be operated independently in order to facilitate extraction in strong winds. In very wet weather, driving snow and at night they can be closed and form complete weather-tightness

Adequate natural light to the workshops below is available when the shutters are open.

BRITISH PATENT NOS. 536127, 536942 AND 536943



OPEN

When fully opened, the specially designed louvres provide an almost instantaneous clearance of fumes, smoke etc., and, what is equally important, give adequate natural lighting to the workshops below.

HALF OPEN

It is often dangerous for rain to fall through the open roof of a workshop. In very light rain Hills Shutters can be partly closed and still permit a very high percentage of extraction.

CLOSED

In driving rain, sleet, etc., the Shutters can be closed down completely and they are then weather-tight.

HILLS

HILLS PATENT GLAZING COMPANY LIMITED

ALBION ROAD, WEST BROMWICH. 'PHONE : WEST BROMWICH 1025 (6 lines)

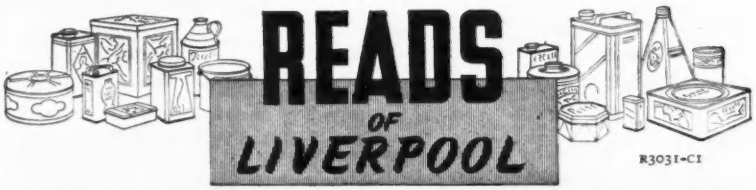
London Office : 125 HIGH HOLBORN, W.C.1. 'Phone : HOLborn 8005/6

M.W.54

As a man is judged by the company he keeps, so the quality of an article is often assessed by its apparel—the Container. If your products are—or can be—marketed in Metal Containers, either Drums or Tins, it will cost you nothing and possibly profit you to get into touch with Reads of Liverpool.

General Drum Manufacturers since the 1860's, for fourteen years Reads have specialized in full aperture Drums—liquid tight if required—together with many other special packages.

Reads can say with authority that they have handled some of the most difficult packaging problems in the country, especially where Metal Containers are designed to identify and enhance the quality of the product.



R3031-C1

READS LIMITED, 21 BRIDGEWATER STREET, LIVERPOOL, 1. ROYAL 3223
AND 227 GRAND BUILDINGS, TRAFALGAR SQUARE, LONDON, W.C.2. ABBEY 5351
ALSO AT GLASGOW, BELFAST, LEICESTER AND CORK

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

BOUVERIE HOUSE, 154 FLEET STREET, LONDON, E.C.4

Telegrams: ALLANGAS FLEET LONDON
Telephone: CENTRAL 3212 (12 lines)
GLASGOW: 116 Hope Street (Central 3970)
BIRMINGHAM: Daimler House, Paradise Street (Midland 0784-5)

THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers Limited

VOL. LIV
No. 1395.

March 23, 1946

Annual Subscription 21s.
Overseas 26s.

Scientific Men in Business

COMING events cast their shadows before; and as long ago as 1937 Cambridge University Appointments Board, on the initiative of its then chairman, Sir Will Spens, started an inquiry, the purpose of which was to disclose how far the university was equipping students for business and whether employers were making the best use of the men trained by the University. The committee was a strong one, consisting of a mixture of university professors and teachers and of business men of such calibre as Mr. A. S. Butler, chairman of the De Havilland Aircraft Co., Mr. J. O. M. Clark, chairman of J. and P. Coats, Mr. Geoffrey Heyworth, chairman of Lever Bros., and Lord Trent, chairman of Boots. These names are recorded here because they clearly give weight to the findings of the committee. Although the inquiry primarily related to the years just before the war, the report has not been written until quite recently, and there is no reason to doubt that the findings of the Committee apply to the immediate present with quite as much force as to the world of 7 or 8 years ago which has now fallen about our ears.

Much concern was given to the direct preparation of men for a business career without reference to other callings which they might enter as a preliminary. At the university, it is recognised, men will study certain subjects upon which they may become professionally qualified, such as law, commerce, science and so forth, and after that they will leave the university and enter business. The chemical industry is largely interested in the part that will be played by scientific men in industry and it is that portion of this excellent report which demands our attention.

Already the Committee foresaw that the trend of social organisation and of education would be in the future to make higher education depend on the capacity of the individual rather than on the depth of his family purse, and the Committee records that "the process of selection by ability is taking place at all ages and educational levels and will greatly affect the industrial population." It is therefore likely that business will to an increasing extent recruit men from the universities, although the Committee recognises that what business seeks is men who can perform the task required and not men who have received a particular type of education. Many of the best business leaders have never been to a university. Nevertheless, the increasing tendency to

On Other Pages

give a higher education to all brighter boys leads to the conclusion that "business, whether it desires it or not, will have to pay special attention to the recruitment of university men if it is to have an ample reservoir of ability from which to draw its leaders."

Bearing these facts in mind, the Committee notes that the complexity of modern business is great, and likely to increase. On the commercial side it will involve closer interaction with government departments and national policy, both domestic and foreign. On the scientific side it will involve closer attention to fundamental research and the wider application of science in production, distribution, and organisation. On the operative side it will require men better qualified for the selection, allocation, and training of employees and for helping to maintain good internal morale and efficiency. This increased complexity can be dealt with properly only if business has an adequate supply of the ablest minds.

Business has no use for slackers. The Committee regards a slacker as one who has not pulled his weight at his university and has given his time to enjoyment rather than to study. We are not at all sure that this is a good criterion. The tendency in the healthy young is nearly always to play, and there are many who have not shown much interest in study at that age who have yet proved very successful when thrown into a world in which they must sink or swim. The naturally adventurous are not studious. It is perhaps natural, however, that a business, in selecting men direct from a university, will not consciously choose those who have appeared to their tutors to be lazy. Neither does business look kindly, however, upon the over-studious. It requires the practical man rather than the bookworm. Here, no doubt, is something which scientific men will take to heart. The intensive study of science is so absorbing to many engaged in it that they find difficulty in adjusting themselves to the wider life around them. It is in this respect, perhaps more than any other, that many scientists in industry fail to rise to the higher administrative posts. Business requires minds capable of appreciating the fundamentals of a situation and bringing to bear on it a detached consideration which makes it easy to assimilate or initiate new ideas. It is this mental attitude, variously called openness of mind, breadth of outlook, or initiative, which appears to be the best contribution of the university man to business. It guards him against that too narrow perspective which is constantly said to be the chief danger of the business man. Business requires also good mixers and men who in every sense of the word are "sportsmen."

Where does the scientific man come in, in all this? The view has become established during the war that training for a particular profession is not necessarily a reason why a man should be selected for the higher administrative posts. The personal qualities of the man must first decide his suitability and his inherent knowledge comes second. This appraisal is in a sense a halfway house, because the view is growing that those who will ultimately be called upon to become administrators must first be trained for that specific job.

Here, however, are the views of the Committee as set forth in their report. We quote *in extenso* two paragraphs, not only because these two paragraphs have our own full support, but because they are the views of industrialists and teachers of high repute.

"It is certainly desirable that a large proportion of the higher administrative posts should be held by men with a scientific training, particularly in manufacturing firms. The ultimate decisions of policy will depend on these men and they are likely to be more firmly based if the administrator clearly understands the scientific techniques involved in manufacture. Moreover, some scientifically trained men lose interest after a time in the immediate problems of a material science and feel an urge to undertake work involving more human contacts, so that it is natural they should go on to the administrative side of business. No objection can be taken to graduates on the scientific side going over to the administrative side if they feel inclined to, and there is little doubt that in many firms they will tend to make better administrators than those without scientific qualifications. There are, however, many objections to the all too common practice of so rewarding and regarding the technical and administrative sides of business as to force the scientific man who is ambitious, to go over to administration at too early a period as a means of attaining what are regarded as the highest positions. There is a fundamental snobbery running through our whole social system which tends to regard those who deal with organisation and finance as superior to those who deal with research and production.

"The only way in which to make science

properly available in the public service or business is to make the technical expert equal to the non-technical administrator in every grade of promotion and to give him equal pay and equal status. In this way the expert at any stage of promotion would be dealing with an equal on the administrative side and not a superior, his immediate superior being scientifically qualified like himself. It is at least arguable that the highest technical officer should be on the board of directors, so that scientific matters can be presented fully to the board by one of its members."

That is an admirable summary of the position and we would not mask its importance by adding or abating one word.

NOTES AND COMMENTS

U.S. Census of Production

MR. SECRETARY WALLACE, of the U.S. Department of Commerce, has always been a keen exponent of the value of an up-to-date intelligence service for industry, and his recently-announced programme includes a balanced development of current statistics. Our own authorities, as is now well known, have also not been idle in this respect. The first U.S. census of what is known as the "bench-mark" type, to cover 1946, will be along familiar lines; it is hoped to provide some information on employment, wages and hours, and a reasonable amount on individual products, fully detailed in certain instances. The programme is already well under way and results are being published in "Facts for Industry," issued by the Department. Accurate production figures have their obvious uses, especially in market research, but in regard to distribution the position is less satisfactory, and special difficulties arise in the chemical industries. The Chemical Marketing Research Association has been very helpful in minimising these difficulties, and reporting procedure has improved. The census forms have been simplified, and manufacturers have acquired clearer appreciation of the need of reporting and greater skill in doing it.

Chemical Statistics

ACCURATE distribution figures are often difficult to obtain in the chemical as in other industries owing to uncertainty about ultimate destination; and reporting by consumers is equally indefinite and may involve the further difficulty of inconsistent terminology. For example, the census inquiry as to chlorine may be taken to include hypochlorite bleach, and figures for 100 per cent. sulphuric acid might include some of lower strength. Consumption data will be mainly on an industrial or plant basis rather than in terms of end products; *i.e.*, total consumption of a given item will be reported without reference to the product or process in which it is used except in certain cases where more accurate information is obtainable. The information received on the forms filled in may be utilised in various ways, and a skilled statistician will be able to give additional and special information which might otherwise be buried under a more general manipulation. It is clear that, to get the best results, close and intelligent co-operation with the industries concerned, both individual firms and trade or research associations, is essential. Views and suggestions from the associations are particularly welcomed. Preliminary drafts of many of the report forms are now available and more will be ready in a few months.

Documentation

AMONG the many interesting short articles in the January issue of *Standards Review*, the organ of the British Standards Institution, which has only just been published, thanks to unavoidable delays, we commend to our readers particularly the one covering Standardisation in Documentation. The subject has not been neglected in the past by the Institution, and British Standards already deal with printers' and authors' proof corrections, and with universal decimal classification. It is, however, encouraging to read that in addition the vexed questions of indexing and bibliographical references are being taken in hand. A ruling on the best system—or at any rate a uniform system—of indexing would be most timely. Is the first word of an item the only one to be taken into account, or is the whole series of letters in an entry to be considered, neglecting the intervening spaces? A standard set

of rules would provide an excellent answer, and would deal also with the problems of prefixes, hyphens, abbreviations, etc. We hope that some indication will be given also of the line to be taken in indexing foreign items. In the matter of bibliographical reference, the article does well to describe this as "an even more complicated subject." Many and various are the pitfalls; yet a standard form even here should not be impossible to evolve, and will certainly be a boon to anyone who is obliged to deal with "the literature." We look forward to both these publications with the greatest interest.

Better Working Conditions

EVIDENCE continues to accumulate to show the increasing importance of amenity in industry. As we indicated in our leading article last week, the fortune of certain sections of the chemical industry depends in great part on the provision of better working conditions. We have been informed, too, by a paper-maker, that it is becoming daily more difficult to persuade men to work at the "wet end" of a paper-mill. This is all perfectly logical: you cannot educate a human being to a higher degree of culture, and then expect him to spend his life happily, doing dirty and distasteful work. If he is a wise man he will be willing to work temporarily in unpleasant conditions, giving his mind the while to the possibility of amelioration—and that is where the works' suggestion box comes in. If he is a less wise man, he will simply throw up the job and go into an easier trade, and his employer may be pardoned for saying "good riddance"—though that doesn't solve the man-power problem.

An American Comment

AT the recent Industrial Accident Prevention Conference in London, Mr. R. S. F. Schilling, secretary of the Industrial Health Research Board, cited discontent, discomfort, and inefficiency of working conditions as factors contributing adversely to the accident rate. So that the A.B.C.M., in shifting the accent of their works' activities from "safety" to "amenity," are in fact making little real change: they are merely tackling another aspect of the same problem. A shrewd, but not unfriendly, American observer, quoted in *The Times* recently, commented on the difficulty this country was having in recruiting labour for uncongenial ill-found jobs, especially in the heavy industries, the implication being that they arrange these things better in the States. That may be so; and if so it is not beyond our powers of ingenuity to equal or surpass them. At the lowest level, it would be good business to try.

Smoke Abatement

ALTHOUGH the "Good Heating for Every Home" Exhibition which is now being held at the Royal Horticultural Society's Hall, Vincent Square, London, is designed chiefly to display domestic heating appliances, it is set against the larger background of smoke abatement, a subject which is becoming of increasing importance now that this country's industries are once more getting into full stride on a peace-time basis. Much valuable work in this direction has been done by the National Smoke Abatement Society, whose annual meeting was held this week. The reconstitution of the Society during the past twelve months has given it new life and there is every indication of a more vigorous pursuit of its policy of helping to bring an end to the cruder ways of using coal that lead to the pollution of the air.

Visual Proof

STRIKING illustrations—pictorial and otherwise—of the ravages wrought by smoke pollution, can be seen at the exhibition. For instance, there are two stones from the House of Commons. In their original condition they were almost identical, but now the beautifully incised decoration of one has been almost completely destroyed by the action of acid-laden smoke. The Fuel Research Station, which is making a survey of atmospheric pollution as part of its research on the occurrence, production, and use of coal, shows some telling statistics, as well as some of the scientific instruments it uses. Organised by the Solid Smokeless Fuels Federation, the exhibition will continue until March 30.

In Sweden, control of imports of aluminium and aluminium alloys has been abolished, together with price control measures on aluminium ware. This follows the decision to discontinue the equalisation payment to Swedish aluminium producers to overcome the discrepancy between domestic and world prices. As a result, Swedish aluminium manufacturers will have to close down.

Chemical Works and the Factories Act

II.—Health and Machinery

by B. S. DYER, B.Sc., A.R.I.C.

THE Factories Act of 1937 is divided into 160 sections, in 14 parts, and these will be considered in their logical order and linked with the relevant Factory Orders which are conveniently published in the same sequence. The chemist is referred to Section 152, where recurring terms with specialised meanings are defined, for assistance in interpreting the requirements of the Act. The registers and factory forms mentioned in the text may be obtained from H.M. Stationery Office.

Part I—Health—contains eleven sections, which lay down the general requirements of the environment, having specific bearing on the health of the workers. Section 1 provides for the adequate internal cleanliness of the factory. The main requirements are that (a) the accumulations of dirt and refuse shall be removed daily by a suitable method from the floors and benches of workrooms and from the staircases and passages; (b) the floor shall be cleaned at least once a week by washing or by sweeping if suitable; (c) all inside walls, etc., to be cleaned in a manner and at intervals depending on the type of surface, for example: (i) with smooth impervious surface, to be washed at least once in every period of 14 months; (ii) with a painted or varnished surface, to be repainted at least once every seven years and washed every 14 months; (iii) in other cases, to be white-washed or colour-washed at least once every 14 months. Records of the dates of painting must be maintained on the general register for inspection by the factory inspector.

Amendments Permitted

The section empowers the Minister to make amendments for certain types of factory if he considers that the foregoing requirements are inappropriate. Accordingly, there is an Order (The Factories (Cleanliness of Walls and Ceilings) Order No. 487 of 1938), amending paragraph (c) for certain factories, including chemical works, so that it applies only to parts of walls, etc., less than 20 ft. above the floor level, but remains unchanged for certain parts, *e.g.*, engine houses, fitting shops, mess rooms, etc., which may be considered as "normal" parts of the factory. It further provides for an exemption from sub-paragraph (c) (iii) if the walls are painted with a washable water paint at least once every three years and washed at the normal time, but in this case a certificate of the paint used must be furnished by the maker and attached to the general register.

The requirements of space for each individual worker so as to prevent overcrowding are laid down in Section 2. The general criterion is contained in paragraph (i) . . . "a factory shall not, while work is carried on, be so overcrowded as to cause risk of injury to the health of the workers employed therein." The normal minimum standard is 400 cu. ft. of space for each worker, in the calculation of which no greater height than 14 ft. may be taken into account. Each workroom must have a notice indicating the maximum number of persons allowed to be employed under this section. In modern chemical process buildings, action is seldom necessary to enforce this requirement, but in other rooms, such as the packing departments, which may come under the chemist's supervision, the limit may possibly be approached. In normal cases, however, considerations of efficiency in operation require a larger space than that laid down, apart from questions of health.

Temperature and Ventilation

The atmospheric conditions of work are considered in Sections 3 and 4, which deal respectively with factors of temperature and ventilation. Effective provision must be made for maintaining a "reasonable" temperature, which is defined as not less than 60° F. after the first hour of work where the main proportion of the work is done in a sitting position, and where no serious physical effort is required. At least one thermometer must be provided in every such workroom. No upper limit of temperature is laid down, but it is obvious that even in the worst circumstances, every effort should be made to maintain a reasonable temperature for simple reasons of efficiency, apart from any legal requirements. Section 4 states that . . . "effective and suitable provision shall be made for securing and maintaining by the circulation of fresh air in each workroom the adequate ventilation of the room, and for rendering harmless, as far as practicable, all fumes, dust and other impurities that may be injurious to health generated in the course of any process or work carried on in the factory." The chemical engineer should bear these requirements in mind when considering a new process, and the process manager should see that the arrangements for ventilation really are adequate and that no unduly cold air is introduced. The best

arrangement is to have a thermostatically-controlled heater on the air inlet, but the position of the thermostat element should be chosen with care so that it really is representative of the general conditions. The ventilation and temperature are interdependent and, unless co-ordinated, the workers may adjust them for comfort and not for efficiency. In addition to this section, there are subsequent special regulations dealing with ventilation; for example, Section 47 deals with the removal of dust or fumes, and Section 52 with conditions in humid factories.

Lighting Standards

Lighting requirements are laid down in Section 5, the general clause being that . . . " effective provision shall be made for securing and maintaining sufficient and suitable lighting, whether natural or artificial, in every part of a factory in which persons are working or passing." The minimum standards are defined in The Factories (Standards of Lighting) Regulations, No. 94, of 1941. For a normal factory, these provide that the general illumination over those portions where persons are regularly employed shall be not less than 6 foot-candles measured in a horizontal plane at a level of 3 ft. above the floor, and not less than 0.5 foot-candles at floor level over all other interior parts of the factory where and when a person is passing. The regulations also lay down requirements to prevent glare. The standard of 6 foot-candles is waived for certain works named in the schedule, *e.g.*, cement works, gas works, electric stations, tar distilleries, etc., although chemical works as such are not specifically mentioned.

The regulations, however, give power to the Chief Inspector of Factories to exempt certain factories as he may consider necessary, and this was done in the case of chemical works by a certificate dated February 19, 1941, in which the general illumination in places where work is being carried on may be not less than 2 foot-candles, and in the normal working places it may be not less than the normal 6 foot-candles, measured 3 ft. above the floor level. Certain of the regulations are waived also by a similar certificate for the case of danger buildings of explosives works, where illumination is carried out by bulkhead or external lighting. Apart from the general loss of efficiency among workers, insufficient illumination is probably responsible for a very large proportion of the accidents in a chemical works. Particularly has this been true during the war where permanent blackout arrangements necessitated artificial lighting even during daylight hours. Every effort should now be made to utilise the maximum amount of natural illumination, as, apart from fuel economy considerations, the psychological effect on the workers is considerable.

Section 6 states that where a process is carried on which renders the floor liable to be wet to such an extent that the wet is capable of being removed by drainage, effective means shall be provided and maintained for draining off the wet. In any well-designed factory, this is obviously provided for and is not normally the responsibility of the works chemist.

The provision of sanitary conveniences is laid down in Section 7, and the requirements amplified in The Sanitary Accommodation Regulations, No. 611, of 1938, from which the numbers required for a factory of given size may be calculated. Washing facilities are covered by Section 42 of Part III.

Sections 8, 9, 10 and 11 define the responsibilities of the district councils, the factory inspector, and the Minister for the enforcement of this part of the Act, and therefore do not directly affect the works chemist. In general it may be said, however, that the onus for enforcing the regulations relating to health lies with the district council to which the factory inspector may report. In cases of default of this responsibility by the council, the inspector may take up the case himself as if he were acting as a district council. The Local Authorities (Transfer of Enforcement) Order, No. 488, of 1938, restricts the enforcement of Sections 1, 2, 3, 4 and 6 by the district council, however, in the case of works for which special health provisions have been made in Ministerial regulations, in which class are included, *inter alia*, chemical works.

Safety Considerations

Part II—Safety—contains 29 sections, each bearing on a particular aspect of safety within the factory. At first sight it may appear that the works chemist has little interest in many of the sections dealing with " mechanical " safety precautions, but in actual fact there may be a number of potentially dangerous points in a normal chemical works, such as, for example, the drives to mechanical stirrers, centrifuges, and grinders.

In connection with the first six sections, which deal with moving machinery, much can be done to improve safety by seeing that the workers wear the right type of clothing, and in the case of women, by wearing hair nets. It should be noted, however, that the supply of this type of protection is no legal defence in an accident, since the *machine* and not the *worker* must be provided with a guard. It is difficult, in any case, to insist on these precautions and it is far more satisfactory and needs less

supervision to see that the machine itself is completely safe.

Section 12 states that every moving part, up to the fly-wheel, of any type of prime mover (including electric generators, motors and rotary converters), shall be securely fenced. In the case of one of the type quoted, this need not be fenced if it is . . . " in such a position or of such construction as to be as safe to every person employed or working on the premises as it would be if securely fenced." It is important to note carefully the clause quoted here, since the plea of being " safe by position " is very frequently made in cases arising from the application of the Act. The fact, however, that an accident has actually occurred to a worker, indicates that access could in fact be gained to the moving part, and this defence is rightly held to be inadmissible. There is no clause which says that the prime mover should be capable of being immobilised in the case of an emergency.

Section 13 deals similarly with transmission machinery, which must also be securely fenced unless " safe by position." Efficient devices or appliances must be provided in every room or place where work is carried on, by which the power can promptly be cut off from the transmission machinery. Striking gear must be used for moving driving belts to and from fast and loose pulleys, and must be so constructed as to prevent the belt from creeping back on to the fast pulley. The Minister has power to make an Order waiving the requirements of this section in cases where it is considered unnecessary or impracticable, but this has not in fact been done, reflecting possibly its universal importance.

In Section 14, the provisions of the previous two sections are extended to other types of machinery to prevent contact of the worker with any dangerous part. The section is general enough to include any type of guard which prevents the exposure of a dangerous part in motion.

Inspection of Machinery

Sections 15 and 16 are conveniently considered together since they deal with the exceptions to the foregoing sections in relation to unfenced and fenced machinery respectively, for necessary purposes of inspection or repair. In determining whether an unfenced machine is to be considered safe by position, no account is to be taken of any person carrying out inspection, adjustment or examination, provided that this person is a male above the age of 18 years. The same applies to a fenced machine when it is necessary to expose the parts for examination, lubrication or adjustment. Both sections confer on the Minister power to make regulations relating to such actions, and this has been done in The Operations at Unfenced Machinery Regulations, No. 641, of 1938, and The Operations at Unfenced Machinery (Amended Schedule) Regulations, No. 2116, of 1942, and No. 156, of 1946. The main provisions of these regulations are that the inspections, adjustments, etc., are to be carried out only by official " machinery attendants " appointed by the occupier of the factory, whose names are entered in the general register, and who are sufficiently trained and instructed in the requirements of the regulations. They are to be supplied with a precautionary leaflet issued by the Minister, and must wear overalls of an approved form to reduce risk of accidental attachment to the machinery. Such persons may deal with transmission machinery in certain processes, named in the Schedule, in which great inconvenience would be caused by a complete stoppage.

Chemical Operations

In this Schedule are some typically chemical operations, such as . . . " all processes in the manufacture of beet sugar, sodium carbonate by the ammonia-soda or Solvay process, sulphur dioxide, sodium hydrosulphite . . . etc." It is important from the point of view of the works chemist to realise that these exceptions do not apply to ordinary process workers, and in the normal factory such inspections and adjustments are carried out only by skilled fitters who have officially been appointed as " machinery attendants " under the requirements of these regulations. Accidents associated with unfenced machinery are almost completely confined to persons of the " process-worker " type, who do not realise the dangers to which they are exposing themselves, and this is an ever-fruitful field for safety propaganda.

Section 17 is interesting in that it enables action to be taken against the actual suppliers of certain types of unsafe machinery.

Of particular interest to the works chemist is Section 18, which requires that any fixed vessel, sump or pit, with an edge less than 3 ft. above the adjoining ground or platform, shall, if it contains any scalding, corrosive or poisonous liquid, either be securely covered or be securely fenced to at least that height, or if this is not possible, " all practicable steps " shall be taken to prevent any person from falling into it. Reference should also be made to the similar requirements of Regulation 1 of the Chemical Works Regulations, which are considered below under the special provisions for safety.

Section 19 provides that no part of a self-acting machine shall pass within a distance of 18 in. from any fixed structure over which any person is liable to pass, so that this

person may have a chance of lying beneath it without being struck.

Under Section 20, no woman or young person shall clean any part of a prime mover or of any transmission machinery while this is in motion, nor shall they clean any part of any machine if this would expose them to risk of injury from any moving part, whether of this machine or of any adjacent machinery. A "young person" is defined, for the purposes of this Act, as a person who has attained the age of 14 years, but not 18 years.

Dangerous Machines

The restriction of employment of young persons at particularly dangerous machines is laid down in Section 21, subject to the fact that either they are sufficiently trained or that they are under the adequate supervision of an experienced person. The machines to which this section refers are laid down in The Dangerous Machines (Training of Young Persons) Order, No. 485, of 1938, and include, *inter alia*, hydro extractors, dough mixers, and guillotine machines. Large numbers of this type of accident are probably a result of the necessary labour dilution during the war, but this position should improve in the near future.

Sections 22, 23, and 24 deal respectively with hoists and lifts; chains, ropes and lifting tackle; and with cranes and other lifting machines. These have been amplified by The Hoists Exemption Order, No. 489, of 1938; The Chains, Ropes and Lifting Tackle (Register) Order, No. 599, of 1938; and The Cranes and Other Lifting Machines (Register of Examinations) Order, No. 600, of 1938, respectively. These do not normally affect the works chemist, coming rather more in the province of the works engineer, but the registers and records of examinations to be kept should be noted, especially in the case of the simpler items such as chains, ropes and lifting tackle, the requirements for which are apt to be overlooked. The general period of examination of these items by a competent person is six months.

Section 25 deals with the construction and maintenance of floors, steps and stairs, and Section 26 with the provision of a safe place of employment and of access to that place. In chemical works in particular, instances may arise where temporary arrangements for a certain operation are continued until an accident occurs. For example, a portable ladder should not be used to gain access to the top of a tank wagon, but either the latter should have a fixed ladder, or a permanent unloading gantry should be built.

Of particular importance to the works chemist is Section 27, which defines the precautions to be taken when work is necessary inside a confined space where dangerous fumes are liable to be present. The chemist will recognise that this may be a frequent necessity in a chemical works, particularly during periods of cleaning and repair of vessels, stills and flues, and similar requirements are laid down in Regulations 7 and 8 of the Chemical Works Regulations. The Ministry of Labour has also issued an informative pamphlet of recommendations in Factory Form No. 814, "Memorandum on Explosion and Gassing Risks in the Cleaning, Examination and Repair of Stills, Tanks, etc.," published in August, 1944, but it should be emphasised that these are purely recommendations and have not, as yet, the force of law in the same way as, say, an Order. The Section of the Act lays down (a) the minimum size of manholes; (b) that the person entering the tank shall wear a safety belt and suitable breathing apparatus, unless it has been ascertained by a suitable test that the space is free from dangerous fumes; (c) that suitable breathing apparatus, reviving apparatus, belts and ropes shall be readily accessible; and (d) that sufficient numbers of persons are trained in the use of the safety apparatus. The Chemical Works Regulations state that all such safety apparatus must be inspected once every month by a competent person, and a record of such inspections shall be maintained for investigation by the factory inspector.

Prevention of Fires

Section 28 relates to precautions to be taken in processes which give rise to inflammable dusts, gases or vapours. The first two sub-sections deal with the construction of plant in which inflammable dust is generated: the plant is to be enclosed, the dust prevented from accumulating, possible sources of ignition are to be excluded, the plant is to be strong enough to withstand a possible explosion, or the explosion is to be confined by the provision of baffles. The third sub-section states the precautions to be taken when disconnecting plant containing inflammable gas or vapour under pressure. The fourth sub-section states that no process such as welding, brazing or soldering which involves heating the plant shall be carried out until all practicable steps have been taken to remove the inflammable contents. The section empowers the Chief Inspector of Factories to grant certificates of exemption from the requirements of the last two sub-sections, and this has been done in the case of welding operations on water-sealed gasholders, cutting and welding operations on steel or wrought-iron gas mains and services, and for welding operations on oil tanks of ships. The welfare aspect of the escape of dust and fume into workrooms is covered by Section 47.

The works chemist may not normally be directly concerned with the provisions of

Sections 29, 30, 31 and 33, which deal respectively with the construction, maintenance and inspection of steam boilers, steam receivers, air receivers, and water-sealed gasholders. A considerable number of certificates of exemption have been granted for specialised appliances by the Chief Inspector, as provided for in Section 32. It may be noted as a matter of interest that steam boilers belonging to His Majesty or to a railway company do not come within the provisions of the Act. The definitions of steam receivers and air receivers bring certain items associated with process plant under the Act, and the technical manager should ensure that the provisions of safety valves, gauges and of the inspections carried out are adequate, although these are normally the responsibility of the engineering department.

Means of Escape

Sections 34, 35, 36 and 37 relate to safety provisions and means of escape in case of fire. The first provides that the district council (or the factory inspector in the case of H.M. Factories) shall certify that the premises are provided with reasonable means of escape, the main part of the section being concerned with the duties of the council in this matter. All means of escape must be properly maintained and kept free from obstruction. Section 36 deals with the construction of buildings relevant to fire risks, as, for example, the outward-opening of doors. All exits must be distinctively marked with red letters, and audible warning of fire is necessary in places where more than 20 persons are employed. Section 37 requires that effective steps must be taken to ensure that all persons employed are familiar with the means of escape and with the routine to be followed, and the technical manager should ensure that this is so in the section under his control. No additional Regulations have been made by the Minister under these sections, although he is empowered to do so in Sections 35 and 37.

Sections 38, 39 and 40 deal with the enforcing powers of the Minister, factory inspector and court of summary jurisdiction relating to special safety measures in factories.

(The previous article in this series appeared in THE CHEMICAL AGE, March 16, 1946, *p.* 283).

The Canadian Government has taken steps to conserve Canada's supplies of thorium. Mr. Mackenzie King stated in the Canadian House of Commons, last December, that Canada was exploring the possibility of using thorium as a substitute for uranium. As far as is known, Canada has no deposits of thorium.

Polysaccharide Chemistry

Lecture in Edinburgh

FURTHER light was shed on the structure of polysaccharides by Professor E. L. Hirst in a lecture to the local sections of the Society of Chemical Industry, the Chemical Society, and the Royal Institute of Chemistry in Edinburgh on February 22. Professor Hirst dealt successively with cellulose, xylan, starch, and plant gums, in order of increasing complexity, paying special attention to the X-ray examination of fibrous molecules, which had given rise to the biggest advance in knowledge of the finer structure of cellulose. Discussing the structure of starch, he pointed out that even the simple division of natural starches into amylose, with long unbranched chains, and amylopectin, with short repeating units, was not yet certain, while the question of the purity of specimens of amylose or amylopectin remained a problem.

The first three types of polysaccharide dealt with were relatively simple, only one, or at most two, modes of linkage of the sugar residues being involved. In the plant gums and polyuronides, however, the position was much more complicated, as the repeating unit there might contain many different sugar residues, *e.g.*, galactose, arabinose, and rhamnose, with uronic acid residues in addition. Some insight into the structural details might be obtained by using a combination of the methods employed with the relatively simpler subjects, *e.g.*, methylation combined with partial hydrolysis and the periodic acid technique.

During the discussion which followed, Dr. Hirst pointed out that in wood chemistry, methods more delicate than isolation with strong caustic were now available for the separation of the cellulose and xylan from the uronic acid fraction. Another important advance in the examination of polysaccharides was the employment of chromatography, using a column of active alumina to separate tetramethyl and trimethyl glucose.

TUNGSTEN PRICES

The Ministry of Supply announces that the issue price of tungsten ore (other than high grade scheelite) has been reduced to 75s. per unit of WO_3 delivered consumers' works in the U.K. Allowances for impurities or low WO_3 will continue on the same scales as hitherto. For special high-grade scheelite to the following specification: WO_3 minimum 68 per cent.; tin maximum 0.60 per cent.; arsenic maximum 0.10 per cent.; molybdenum maximum 0.10 per cent., the price will continue to be 90s. per unit WO_3 delivered consumer's works in the U.K.

Synthetic Soap and Edible Fats

The Fischer-Tropsch Process : A Reminder

THE Fuel Research Station of the D.S.I.R., has prepared a useful note, particularly apposite in these days of fat-shortage, on the application of the Fischer-Tropsch process to the preparation of synthetic edible oils, with reference to recent developments in Germany. A reminder of the advantages of this process is by no means out of place to-day.

The naturally-occurring animal and vegetable oils and fats, which form the normal source of soap and edible fats, are glycerides of straight-chain carboxylic acids containing an even number of carbon atoms (mainly 10, 12, 14, 16 and 18) in the molecule. In order to find an alternative source of such materials, it is necessary to select or synthesise compounds containing the requisite straight-chain carbon structure. Petroleum oils and shale waxes contain paraffin hydrocarbons with this structure, but only in complicated admixture with other unsuitable hydrocarbon types, and they would require extensive refining treatment to provide suitable raw material for the synthesis of fats.

The Fischer-Tropsch process, however, provides a means of preparing hydrocarbons of predominantly straight-chain character from coal. In this process, coal or coke is converted into a mixture of carbon monoxide and hydrogen which is desulphurised and passed over a catalyst at about 200° C., and at pressures of 1 to 10 atm., to yield a mixture of gaseous, liquid, and solid hydrocarbons. These products provide liquid fuels (petrol and diesel oil) but are also a source of high-grade lubricants, waxes, and a wide range of aliphatic (open-chain) chemicals including fatty acids of the type required for soap and edible fat preparation.

German War-Time Practice

In Germany, where the Fischer-Tropsch process has been in commercial operation for about ten years, fatty acids for soap and fat manufacture were produced during the war by the catalytic oxidation of the Fischer-Tropsch soft wax and to a smaller extent of the wax obtained by the hydrogenation of brown coal. The maximum production of suitable acids by this means was about 40,000 tons/annum. Most of this production was used in the manufacture of soap, but about 1800 tons/annum of edible fat (margarine) was produced by reaction of the acids with glycerine (synthesised from propylene, also obtained from coal). The total plant capacity for synthetic margarine production was about 7000 tons/annum.

The synthetic soap possessed excellent lathering power, but had the property of leaving an unpleasant odour on the skin after use, and the synthetic acids were used in toilet soaps only to the extent of 20-30 per cent. of the total fatty-acid content. The synthetic edible fat was quite innocuous in respect of taste and odour, but differed from the natural fats in containing carbon chains with both odd and even numbers of carbon atoms. The Germans claimed, however, that biological tests proved that the synthetic fat was assimilated and utilised by the human body in the normal manner, although, of course, the "long-term" effect of consuming it was unknown. The synthetic fat possessed better keeping qualities than the natural product and on this account was used (after the incorporation of vitamins) in the victualling of submarines.

Fuel Research Work

The Fischer-Tropsch process and its products have been extensively investigated in the laboratories of the Fuel Research Station over a period of about ten years, and the knowledge thus obtained has been invaluable in investigating and assessing the value of the German developments in this field. The synthesis of fatty acids from the products of the process was among the subjects studied at the Fuel Research Station and, although the work was restricted to a laboratory scale, the results confirmed those obtained in Germany in all important particulars. No attempt has, however, been made to assess the value of edible fats prepared from these acids.

In summarising the position it can be stated that, as a result of research work at the Fuel Research Station, scientific knowledge of the Fischer-Tropsch and ancillary processes is practically as complete here as in Germany, but in this country we have no experience of the operation of these processes on the full scale. In conclusion, it is necessary to point out that the Fischer-Tropsch process could not be operated economically in this country at the present time, and, regarded primarily as a source of synthetic facts, the process is very inefficient. Under the best conditions which have been achieved on the large scale in Germany, the production of 1 ton of synthetic fat or soap would require the consumption of 60 to 70 tons of coal.

Canada is becoming a dominant factor in the aluminium foil export market. Before the war, German producers controlled about 80 per cent. of world markets, but large-scale orders have already been received in Canada. As a result, the Dominion Foils (Canada) Company has decided to expand its plant at Cap de la Madeleine, Quebec.

Organic Fluorine Compounds

A Russian Method of Analysis Described*

by N. S. NIKOLAEV

IN this paper† the author reviews the methods which have been used in the past by various workers for determining fluorine and he describes a new method which permits fluorine to be determined during the elementary analysis of a substance for carbon and hydrogen.

During the last few years compounds of fluorine, both inorganic and organic, have been finding wide applications in agriculture and industry, while methods for the synthesis of these compounds have been improved and developed. Considerable interest has, therefore, been aroused in methods of analysis with special reference to the determination of fluorine.

Methods of the Past

Until comparatively recently, although methods of analysis varied with different investigators, they all amounted to the mineralisation of the organic substance by some process or other and the determination of fluorine in the mineral residue. Thus, George Wilson, a contemporary of Liebig, sought to use the latter's well-known method of determining halides in organic compounds. In practice, however, Wilson[1] found it more convenient to use caustic alkali in the presence of silica, followed by treatment of the insoluble silico-fluorides. Bein[2], with the same end in view, ashed the organic substance with lime and then determined fluorine in the ash, in the same way as for calcium fluoride, by treating the residue with sulphuric acid in the presence of silica. The silicon tetrafluoride so obtained was subjected to hydrolysis, and the silica determined gravimetrically. The amount of fluorine was calculated from the weight of silica. Brandl[3] made considerable use of this method for determining fluorine not only in organic substances but also in the analysis of animal tissues.

Wislicenus[4] proposed a special platinum apparatus for igniting the material and retaining the volatile products for analysis. Nevertheless, by no means all organic compounds could be so simply analysed. The fluorine-substituted lower members of the hydrocarbon series are, in most cases, gases or low-boiling liquids, so it is only natural for difficulty to be experienced in these instances in separating the halide in the form of a salt.

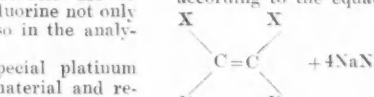
Meslans[5], who synthesised allyl fluoride C_3H_5F (B.P., $-3°C.$) from silver fluoride and allyl iodide, resorted to heating the substance with silica although he established the formula of the compound by the classical combustion method without evaluating the fluorine content. In certain cases the analysis is simplified by the fact that the substance considered is capable of hydrolysis. Most acid halides are of this type. Colson[6] used the hydrolysis method for determining fluorine in acetyl fluoride and propionyl fluoride, compounds which he had synthesised. Their boiling-points are 20.8° and 43.5°C. respectively. A simple titration of the products of hydrolysis gives the fluorine content.

Among processes which involve the separation of SiF_4 must be mentioned the treatment of the substance with concentrated sulphuric acid in a glass vessel and the determination of the fluorine present from the loss in weight of the glass (Helferich[7]) or from the evolved SiF_4 (Moissan; Feigl[8]). On the other hand, many workers with fluorine compounds have restricted themselves to elementary analysis. Thus, most of the results of the Belgian chemist, Swarts, in connection with halogen derivatives of the hydrocarbons, have been obtained by means of elementary analysis only.

Elementary analysis appears to be less suitable when the compound contains oxygen as well as fluorine. Rational methods of determining fluorine have developed only within the last 30 years.

Mixed Aromatic Halides

For determining halides Vaughn and Nieuwland[9] treat the substance under examination with a solution in ammonia of an alkali metal. The reaction, which occurs according to the equation,



$$(NH_2)_2C=C(NH_2)_2+4NaX$$

is completely quantitative in the case of tetrachlorethylene and also in the case of similar fluorine derivatives. The reaction products are dissolved in hot water containing ammonium nitrate, and fluorine is precipitated by means of calcium nitrate and determined as CaF_2. Various aromatic compounds were analysed by this method—fluorobenzene, *p*-fluoronitrobenzene, 1.3-dimethyl-5-bromo-fluorobenzene, etc. In the case of mixed halide compounds chlorine and bromine were determined in the filtrate

* Translated by G. Stanley Smith

† *Izvestiya Akad. Nauk. Khim., U.S.S.R.*, 1945, 309.

after removal of calcium fluoride. The accuracy attainable by this method is 0.05 per cent. of the content.

Cadenbach's Method

A method of special importance is that of Cadenbach.[10] He showed that by combustion in a stream of hydrogen it was possible to transform the fluorine quantitatively into hydrogen fluoride and after absorption in water to determine the acid by titration. An accuracy of 0.8 per cent. was obtained in the analysis of fluorobenzene. The ignition of the substances may also be carried out without the introduction of hydrogen. For this purpose there is employed a platinum tube, filled with granulated lime which also acts as an absorbing agent for the fluorine (Bockemüller). If there is not enough hydrogen in the compound then the combustion may be carried out in a current of air mixed with ammonia. Some substances analysed by this method are as follows: diphenyl ethyl fluoride, 2 per cent.; 2.2'-difluorodiphenyl, 0.9 per cent.; 4.4'-difluorodiphenyl, 0.6 per cent.; difluorobutyric acid, 0.65 per cent. A quartz tube may also be used for the combustion. Fluorine is transformed into SiF_4 and completion of the reaction is ensured by filling the tube with quartz wool. In this way Hubbard[11] analysed Freon.

The method was developed further by Bigelow[12]: fluorine-containing gases and easily volatile hydrocarbon halides were subjected to analysis. They were measured in a gas burette. After mixing with oxygen the gases were ignited in a quartz tube, 46 cm. long and 13 mm. in diameter. The middle part of the tube was filled with 20-mesh quartz, while the end contained larger-grain quartz. The ignition temperature was 900°C. The SiF_4 which was formed was absorbed in a U-tube containing glass beads moistened with caustic soda solution. The solution with the absorbed SiF_4 was analysed by the thorium nitrate method of Hoskins and Ferris.[13] The analytical errors were—for freon, nil; for CF_3Cl, 0.57 per cent.; for CF_3CH_2Cl, less than 0.2 per cent.

Simultaneous Determination

We have extended these methods to allow for the simultaneous determination of C, H, and F in the combustion. The normal method in elementary analysis for determining carbon and hydrogen in fluorine-containing substances does not lead to any difficulties. The tube is filled with copper oxide and lead chromate as for any halide. It is possible to use also ter Meulen's method in which the combustion is carried out in the presence of lead dioxide and manganese dioxide. Bockemüller recommends the introduction of a heated copper spiral.

In our method the sample taken for analysis is well mixed with finely-ground quartz and ignited in a quartz tube in a stream of oxygen. The fluorine forms HF, the hydrogen being afforded by the organic substance itself, and then reacts with the quartz to form silicon tetrafluoride

$$SiO_2 + 4HF \rightarrow SiF_4 + 2H_2O.$$

The hydrogen which separates in this reaction in the form of water is collected together with the water which is produced in the direct combustion of the hydrogen of the organic substance. The water is absorbed in concentrated sulphuric acid, in which SiF_4 is practically insoluble. The gases obtained by the combustion, containing H_2O, SiF_4, and CO_2, are thus freed from water vapour. The next absorbent is potassium fluoride which retains the SiF_4, and then the CO_2 is absorbed in the usual manner. It is necessary, however, to bear in mind that SIF_4 in the gaseous phase containing water vapour can exist only so long as water is condensed.[14] If condensation occurs SiF_4 reacts so that there is a loss both of the fluorine and a part of the water.

$$3SiF_4 + 2H_2O \rightarrow 2H_2SiF_6 + Si(OH)_4.$$

In view of this fact, the condensation of water vapour has to be prevented during the analysis up to the very moment of its absorption in sulphuric acid. In other respects the method presents no special difficulties and is carried out as under.

The Combustion Process

The combustion is carried out in a quartz tube, 17-18 mm. in diameter and 800-850 mm. long, which is placed in a Heræus furnace. The end of the tube which is next to the absorbing apparatus contains oxidised copper gauze, inside which is placed quartz of a particle size 0.5-2 mm. The filled portion is 12-15 cm. from the end of the tube and it occupies 5-6 cm. At this end is placed a platinum spiral. The tube projects 4-5 cm. from the furnace. The bung through which the delivery tube passes is heat-insulated from the furnace by means of an asbestos shield. The delivery tube projects 2.5 cm. from the bung and is connected to the absorbing apparatus: (1) potash bulbs, or a U-tube, filled with beads moistened with sulphuric acid; (2) a U-tube filled with water-free granular potassium fluoride; and (3) two soda-asbestos tubes.

The sample is mixed with finely-crushed quartz and transferred to a combustion boat. The surface of the sample is covered with a layer of powdered quartz. The quantity of silica is 10-15 times that of the sample. The boat with the sample is pushed one-third way into the tube and at the back is placed a copper oxide plug. The rear end of the tube is closed by means of a bung through which passes a tube fitted with a stop-cock. This is connected with a drying vessel and a gasometer containing oxygen. Combustion begins with the front part of the tube which is heated to a temperature

of 850-900°C. The current of oxygen is started and then the hot zone is gradually brought nearer the part containing the sample by means of the movable part of the furnace. The temperature of the tube at this place should be maintained for one hour at 450-500° and then raised to 500-550° for a further half-hour.

During the whole course of the combustion the flame of a gas-burner is played round the front end of the quartz tube to prevent condensation of water vapour. After 10 litres of oxygen have been passed through the tube in 2-2½ hours air is admitted at the rate of 10 litres in 40 minutes and the combustion is then terminated. The increase in weight of the absorbing vessels are calculated to hydrogen, fluorine and carbon.

To obtain accurate results it is necessary to carry out some preliminary combustions with substances of known content, such as aniline hydrofluoride. This is important since the potassium fluoride may be alkaline, and by saturating it with carbon dioxide before the combustion one avoids the absorption of CO_2 by potassium fluoride during the analysis. Further, the sulphuric acid in the potash apparatus should be changed after 4-5 combustions. The concentration of sulphuric acid should not fall below 92 per cent. Hence, if 20 g. are used, the total increase in weight of the potash apparatus should not be allowed to exceed 1.5 g. The reason for this is that in the system, $H_2SO_4 - SiF_4 - H_2O$, silicon tetrafluoride is completely insoluble in sulphuric acid only if the concentration of the latter exceeds 90 per cent. Otherwise there is precipitation of silica and separation of hydrofluoric acid.

Special attention has been given to the choice of the standard substance for preliminary combustion. We found Weinland's salt, $C_6H_5NH_2.2HF$,[15] to be suitable. Its fluorine content can be established by simple titration.

Benzoyl Fluoride Analysed

The method was successfully applied to the analysis of benzoyl fluoride, obtained by double decomposition of benzoyl chloride and ammonium fluoride in benzene solution. This substance was investigated long ago by Borodine.[16] He prepared it from benzoyl chloride and potassium bifluoride. Later, Guénez[17] used silver fluoride, and for its analysis in respect of C and H he carried out a combustion in a copper tube containing copper oxide and lead chromate. Fluorine was determined by decomposing the substance with potassium silicate and subsequently precipitating the fluorine in the form of calcium fluoride.

A simple titration may also be carried out, as in the case of the aniline salt, since benzoyl hydrofluoride is hydrolysed with water. Thus, simple comparisons may be made with the new method. Results obtained for these substances are shown in the accompanying table. They indicate that the proposed method is sufficiently accurate for the purpose. It is, however, unsuitable for substances containing sulphur, phosphorous, and other halides in addition to fluorine.

TABLE 1.

Substance		Percentage composition				
		Calcd.	Found			
			Combustion		Titration	
Weinland's salt ...	C	54.2	54.18	54.37	—	—
	H	6.75	6.82	6.76	—	—
	F	28.6	28.30	28.57	28.35	28.71
Benzoyl fluoride ...	C	67.7	67.32	67.70	—	—
	H	4.03	4.00	3.93	—	—
	F	15.32	15.18	15.50	15.45	15.38

REFERENCES

[1] WILSON, *Edinburgh Phil. J.*, 1852, *53*, 358.
[2] BEIN, *Rep. Anal. Chem.*, 1885, *6*, 169.
[3] BRANDL and TAPPEINER, *Z. B.*, 1891, *28*, 518.
[4] WISLICENUS, *Z. Anal. Chem.*, 1901, *40*, 441.
[5] MESLANS, *Compt. Rend.*, 1890, *111*, 882.
[6] COLSON, *Ann. Chim.*, 1897, *12* (7), 256.
[7] HELFERICH and GOOTZ, *Ber.*, 1929, *62*, 2505.
[8] MOISSAN, *Compt. Read.*, 1882, *107*, 992; FEIGL and KRUMHOLZ, *Ber.*, 1929, *72*, 1138.
[9] VAUGHN and NIEUWLAND, *Ind. Eng. Chem.* (*Anal. Ed.*), 1931, *3*, 274.
[10] CADENBACH, *Angew. Chem.*, 1933, *46*, 130.
[11] HUBBARD and HENNE, *J. Amer. Chem. Soc.*, 1934, *56*, 1078.
[12] BIGELOW, *et al.*, *J. Amer. Chem. Soc.*, 1940, *62*, 268.
[13] HOSKINS and FERRIS, *Ind. Eng. Chem.* (*Anal. Ed.*), 1936, *8*, 6.
[14] JACOBSON, *J. Phys. Chem.*, 1929, *45*, 48.
[15] WEINLAND, *Z. anorg. Chem.*, 1905, *45*, 48.
[16] BORODINE, *Lieb. Ann.*, 1863, *126*, 58.
[17] GUENEZ, *Compt. Rend.*, 1890, *111*, 681.

RDX Secrets Revealed

Canadian Spy Case

DR. RAYMOND BOYER, assistant professor of chemistry at McGill University, is one of the four additional persons now named for espionage activities in the second interim report of the Royal Commission investigating the Canadian secrets case. The report states that the most important part of the work in which Boyer was engaged when with the National Research Council concerned the manufacture, by a process different from that previously employed anywhere else, of the explosive RDX. The success of the project resulted in the erection of large-scale plants in Canada and the U.S.

The Commission's report states that Boyer informed them that, beginning in 1943 and continuing into 1944, he supplied, for transmission to the Soviet Union, full information with regard to this work, which he himself admits was secret. With this information, he said, competent persons would be able to design a plant to produce the material in quantity.

Dyeing Properties of Cellulose

The Phenomenon of Dichroism

AT a well-attended meeting of the Manchester Section of the Society of Dyers and Colourists on March 15, a paper entitled "A Study of the Dyeing Properties of Cellulose" was read by Dr. T. H. Morton, of Courtaulds (Barking) Textile Research School. Dr. Morton said that the practical work particularised was carried out in 1934 and the paper was written for publication in 1939. The war, however, intervened, and the paper had now been revised though not in any considerable detail.

The study of dichroism, or the property of certain crystals of exhibiting different colours when looked at from different angles, tended to summarise the work done at Barking. Little or nothing was done during the war period along the line of dyeing theory, and the paper indicated the lines on which research work was proceeding. The behaviour of dyes in polarised light, or the absorption of dyes in polarised light, had been considered. Furthermore, consideration had been paid to the question of how the dye penetrated into the inside of the fibre, based upon the finished state of dyeing. The purpose was to present a theory which accounted for some of the known behaviour of dyes on cellulose.

A Transverse Wave

It was generally accepted that polarised light had a wave motion of peculiar properties, somewhat similar to wireless waves but shorter in wave-length, being not unlike a sound wave though of a different kind. There was what was termed a transverse wave, so that there was one direction in which it had certain particular properties and another direction in which it had others.

Some 30 or 40 years ago Ambronn made some observations on the dichroic behaviour of cellulose fibres dyed with certain direct dyes, and further research work had been carried out by Preston and Neale. The discovery was made that all direct dyes, all vat dyes in the reduced leuco form, certain insoluble azo dyes, and various acid dyes on ramie exhibited positive dichroism, while, on the other hand, elongated direct dye micelles and dye crystals exhibited negative dichroism. An explanation of these dichroic phenomena was that of the absorption of dye by cellulose as single molecules and not as micelles. With respect to the dyed material, elongated direct dye molecules were orientated parallel to the cellulose molecular chains with which they had been co-ordinately combined, while direct dye molecules were placed transversely across elongated dye micelles.

Confirmation of this was observed by the dichroic behaviour of ramie dyed with direct dyes in alcoholic solutions, and it was the general point of view that there was molecular dispersion of such dyes. It was the case, however, that normal, fully oxidised vat-dyed materials were not particularly dichroic.

Dr. Morton then dealt, in some detail, with a molecular theory of the dyeing of cellulose with substantive dyes, the dye solution being regarded as containing particles of many sizes in a state of dynamic equilibrium. The particles varied in size from molecules to large aggregates. It was to be explained that cellulose was merely capable, owing to mechanical reasons, of absorbing molecules and small aggregates.

It was presumably the case that the diffusion of dye molecules through the capillary pore system of cellulose was not a free diffusion but was a process of thermal activation. The result of the investigations tended to show that the factors involved might be regarded, inclusively, as a mobility factor. This mobility factor represented the retardation of diffusion from the speed anticipated for a free diffusion with absorption. The value of the factor had a range of 10^{-1} to 10^{-4}, in the case of the direct dye class.

The diffusion of the dye molecules accounted for the absorption progress. The dye molecules were continually reformed from the larger particles in the dye solution, to the interior of the cellulose fibre, until in the end a correct equilibrium was achieved between dyed cellulose and dye solution. The lecture concluded with a discussion of the essential conditions necessary for substantivity of dye on cellulose.

CHEMICAL ENGINEERING GROUP

Dr. G. E. Foxwell, Mr. J. A. Oriel, M.C., Mr. H. ter Meulen, and Mr. W. S. Lloyd Willey are the members of the committee of the Chemical Engineering Group, S.C.I., who are retiring this year and are not eligible for re-election. Members are invited to send nominations to fill the vacancies, such nominations to be signed by not less than three members and to reach the hon. secretary not later than April 8. The annual meeting and luncheon will be held at the Waldorf Hotel, London, on May 22.

A reprint of Mr. N. N. Murty's paper "Adhesives Based on Shellac and its Derivatives," which appeared originally in *Plastics* (December, 1945), has been published by the London Shellac Research Bureau (India House, Aldwych, W.C.2).

The Italian Cellulose Industry

A Note on the Present Position

(from Our Rome Correspondent)

IN approaching the study of the cellulose industry in Italy, it is essential first to make a general review of economic conditions between the two world wars. In that period two major economic phenomena affected the situation: (1) the prohibition of immigration; (2) an almost complete blocking of currency exchange between Italy and foreign countries.

The following table gives some indication of the movement of foreign trade during the period (figures in million lire).

TABLE 1.
FOREIGN TRADE, 1920-1939.

	Imports	*Exports*	*Balance*
1920	26,822	11,774	−12,694
1926	25,879	18,665	− 7,214
1930	17,347	12,119	− 5,228
1934	7,675	5,224	− 2,451
1938	11,273	10,499	− 774
1939	10,297	10,802	+ 605

It will be seen that 1939 was the only year in which there was a credit balance, of the relatively small amount of 605 millions, and that was due simply to the fact that Italy had not taken part in the war. No doubt, had Italy continued to remain neutral the country would have experienced a period of prosperity such as it had not yet met with, and its financial position to-day would rank among the most stable in the world. The example of certain South American countries, such as the Argentine Republic, provides proof of this. The figures of Italy's foreign trade in the period 1920-39 clearly show the seriousness of the progressive wastage of gold reserves and foreign exchange, a wastage which was only very slightly counterbalanced by remittances from emigrants, by the tourist trade, and by foreign investments. This explains why, faced with the growing difficulty of procuring the foreign exchange necessary for the import of cellulose, a number of concerns came into being in Italy, between the two wars, making use of very different types of raw material in order to provide a proportion of the cellulose necessary for the production of paper.

Italian paper mills have a potential total capacity of about 450,000 tons per annum, *i.e.*, about 10 kg. per person per year, revealing that the Italian people, in this as in other fields, were under a handicap in comparison with other nations possessing a higher standard of life. The figure may be compared with 25 kg. per head in France, 35 kg. in Britain and 95 kg. in the U.S. Moreover, the Italian paper mills, although enjoying a high reputation for the production of good-quality papers which were much in demand overseas, were obliged for the home market to make use of large quantities of mechanical pulp, with a resultant lowering of the quality, simply for the purpose of satisfying the home market, which demanded a low price rather than a high standard.

Thus the requirement in cellulose of the Italian paper industry amounted only to 150,000 kg. per annum, the total quantity of raw material necessary for the aggregate production of 450,000 kg. already mentioned being made up with rag pulp for special papers and mechanical pulp, etc., for papers of less high quality. The following table of cellulose imports, reckoned in averages for five-year periods, indicates that the figure was indeed higher than 150,000 tons in latter years; but this figure includes also the cellulose intended for the rayon industry which developed rapidly in the period under review.

TABLE 2.
IMPORTS OF CELLULOSE.

	Annual Average (metric tons)
1919-1923	54,000
1924-1928	135,000
1929-1933	185,000
1934-1938	262,000

The next table indicates (in metric tons) the production of cellulose for use in paper mills between 1938 and 1942. In 1943, the invasion of Italy saw the commencement of the destruction and dispersal of the industrial establishments of Italy.

TABLE 3.

	To Paper Works	*To Cellulose Plants*	*Total*
1938	15,000	45,000	60,000
1939	38,000	54,000	92,000
1940	51,000	65,000	116,000
1941	55,000	70,000	125,000
1942	55,000	70,000	125,000

Among the paper mills, 23 had established relatively unimportant branches for the production of their own cellulose, with outputs varying from 6000 to 152,000 quintals of 100 kg. per annum. Over and above these, eleven cellulose plants were established, some by newly-founded independent companies. The table overleaf indicates the location and output of these eleven specialised cellulose works.

For raw material, the works at Mantova, Cuneo, Tolmezzo, and Tresigallo made use of wood (fir or pine), those at Naples, Chieti, Foggia, Castelraimondo, and Ferrara used straw and esparto: while those at Torviscosa and Capua were examining the possibility of using reeds and beechwood. The processes worked were as follows: the bisulphite process at Mantova, Tolmezzo and Capua; the sulphate process at Cuneo and Tresigallo: the monosulphite process at Ferrara;

the chlorine process at Foggia, Castelraimondo, Naples, and Chieti; and a special process at Torviscosa.

TABLE 4.

Name and Location of Factory	*Total Potential Output (metric tons)*
I. Cellulose for paper:	
Cartiere Burgo, Mantova	20,000
,, ,, Cuneo	15,000
Cellulosa Cloro-Soda, Naples	7,000
,, ,, ,, Chieti	15,000
Istituto Poligrafico, Foggia	20,000
,, ,, Castelraimondo ...	7,000
Cartiera di Tolmezzo, Tolmezzo ...	20,000
Cellulosa Nazionale (Celna), Tresigallo	15,000
,, ,, ,, Ferrara	7,000
	126,000
II. Cellulose for rayon :—	
Snia Viscosa, Torviscosa	30,000
Soc. Fibre Tessili Artificial, Capua ...	15,000
	45,000

When we come to examine the present situation of this industrial complex, it is seen that the greater part of it has been laid waste and disorganised, with little immediate prospect of rehabilitation, owing to the almost complete lack of transport and raw materials. This is indeed, in some sort, the position of the majority of Italian industry, especially in the south-central region, which suffered most both from the allied bombardment and from the systematic destruction wrought by the Germans, who had plenty of time to carry out this part of their programme before retreating across the Gothic Line.

Among the plants which produced cellulose for paper works, the only ones that are functioning, and those only partially, are the factories at Foggia and Tolmezzo. Thus the paper industry which is making laborious efforts to reorganise itself, has so far been unable to attain a production figure higher than 20 per cent. of that before the war. Raw materials now in use consist mainly of mechanical pulp and repulped waste paper, and the quality of the material produced is of the poorest. On the other hand, selling prices have reached astronomical heights: grades of paper which before the war sold at 3-4 lire per kg. are now quoted at 70-80 lire. The few cellulose-type papers available are priced at 250-300 lire per kg., while hand-made papers range from 400 to 600 lire. This is, of course, an entirely artificial situation and merely indicates the precariousness of the present economic position.

The cellulose industry proper in Italy suffered much more severely at the hands of the Germans than did the paper industry, principally because it was located in a comparatively small number of conspicuous modern factories, whereas the paper works were generally situated in remote valleys in North Italy and very largely escaped devastation. It is therefore probable that the paper industry will make a more rapid recovery than the cellulose industry; indeed, this recovery is now under way. However, in view of the scarcity of raw materials and the gradual exhaustion of the repulped waste available the question of a renewal of the cellulose supply is already urgent. The most obvious and complete solution would be the re-establishment of supplies from abroad. This is a comparatively easy matter in the rayon industry, which can readily obtain foreign exchange by re-export of a proportion of the cellulose manufactured into textiles.

For the paper industry, however, the solution is rather less obvious, though the necessary foreign exchange could be obtained by means of exports of horticultural and agricultural products and their derivatives (wine, vermouth, etc.). However, as such products will have to be sold at international prices, which at the official rate of exchange represent a value in lire 10 to 20 times lower than internal values, the result will be to make domestic production of cellulose a much more economic procedure than the import of cellulose from abroad. Thus it appears likely that the cellulose factories in Italy will also be gradually set working again, greatly to the benefit of the Italian paper industry, though this is not to say that the import of cellulose is to cease altogether.

If Italy is to rise again, however laboriously, and to regain the economic position which she has temporarily lost by the folly of engaging in war, not only must the consumption of paper per head be considerably augmented, but also the quality of the paper produced must be improved. Thus the annual requirement of cellulose for the paper industry will rise above 150,000 tons and, with the figure increasing year by year, a reasonable equilibrium will be established between domestic production and imports, as is normal in other industries. The small but select band of workmen, technicians, and administrators who, in the ten years preceding the war, built up a new industry from scratch, will see that their apprenticeship is not wasted, and will rebuild it again, however arduous the task.

Styrene Copolymers

A Study of their Uses in Surface Coatings

IN a paper to the London Section of the Oil & Colour Chemists' Association, at its meeting on February 15, Mr. D. H. Hewitt and Mr. F. Armitage discussed the use of copolymers of styrene with drying oils, and more especially with drying oil polymers, in the production of surface coatings.

The authors commented that, among those raw materials of which production had been stimulated as a direct result of the war, styrene was perhaps the most interesting as an ingredient of surface coatings. They outlined the considerations which, in 1942, had governed their choice of styrene from a large number of polymerisable monomers as a subject for research. About that time they summarised the position in a review published elsewhere; and in the present paper they recapitulated some of their earlier conclusions, from which it did not appear that polystyrene would become of first importance either as a major film-forming ingredient such as nitrocellulose or as a varnish resin. On the other hand, one important type of modification, namely, copolymerisation, was comparatively uninvestigated at that earlier date. Copolymerisation with conventional bifunctional molecules, such as methyl methacrylate, appeared to offer little advantage except for modification of solubility and adhesion characteristics. Copolymerisation with butadiene, however, was known to give polymers in which cross-linking could be effected by vulcanisation. It seemed that modification with diene and other unsaturated bodies present in vegetable drying oils might be of considerable interest, bearing in mind the success which had attended modification of glycerol phthalate and phenolformaldehyde resins. They had found that styrene polymerised with dehydrated castor oil over a wide range of proportions and, surprisingly, over a wide range of viscosities to form homogenous products having interesting properties.

Report on Experiments

Discussing the experimental work, they described some of the results obtained with their standard or normal copolymer reaction between styrene and polymers containing drying-oil radicals, their standard formulation being 50 parts drying oil, 50 parts styrene monomer, and 100 parts solvent. That formulation represented a particular reaction mixture which, in certain circumstances, would produce almost complete polymerisation of the styrene, yield a clear varnish of suitable viscosity for paint manufacture, and give a clear, quick-drying film subsequently hardening by oxidation after addition of the usual driers.

The authors went on to consider the results of varying the proportions of reactants used. Particularly useful products could be obtained within the styrene/oil ranges of from 40/60 to 30/40, keeping the solvent at 100 parts, and using xylene as solvent. That meant an alteration in oil length of the finished varnish from 45 to 65 per cent., since the polymerisation of the styrene was not quite complete. All products within that range yielded clear films—at 40 per cent. oil length rather brittle, and at 60 per cent. oil length flexible and of good durability, but rather slower in drying. Within the range of 45-65 per cent. oil length, the proportions of solvent present could also be altered. Increase of solvent over 50 per cent., as would be expected, reduced the rate of styrene polymerisation; decrease of solvent below 50 per cent. allowed the styrene to polymerise faster and probably with increased molecular weight, since with solvent content of less than 35 per cent. incompatible products were often obtained.

Results Without Solvent

If the reaction were carried out in the complete absence of solvent, with 50 parts styrene and 50 parts oil, a heterogeneous mass resulted; but homogeneity might be obtained by adding the styrene at intervals to the oil and thus controlling the molecular weight of the polystyrene chains. Where certain varnish resins were used with the oil, however, the styrene/varnish reaction might be carried out with all the reactants present from the start, since the resin served to shorten the resulting styrene chains, besides slowing down the reaction rate. The solventless type of product differed fundamentally from the solvent type in so far as it was permanently thermoplastic.

Discussing the results of the replacement of the solvent xylene by white spirit, the authors pointed out that in the standard reaction, since white spirit was an inferior solvent for polystyrene or copolymers containing polystyrene, finished solutions tended to be opalescent, although films were quite clear, as with xylene. An additional difference was that rate of viscosity increase in white spirit was rather quicker than in xylene, as would be expected; so that with the same starting ingredients a finished viscosity of half poise might be obtained in less time (say, 10 as against 15 hours), but unfortunately the change in rate of styrene polymerisation did not correspond with the increase in rate of viscosity, so that

instead of polymerising 85-90 per cent. of the styrene, only 75-80 per cent. was polymerised. The styrene consumption could be improved, however, by the same technique as in solventless varnishes, *i.e.*, by the addition of styrene at intervals. This technique served to give less opalescent products. The character of the film from interval addition experiments was the same, for all practical purposes, as the film from straight reflux with all ingredients in at the beginning. Nor did the film (except for a slightly longer period of solvent release) differ in any respect from a xylene reaction film.

Obviously, it was possible to make copolymers of any given oil length by various methods, starting with different styrene/oil ratios and polymerising to a pre-determined degree before distilling off uncombined styrene. By careful choice of polymerising solvent, that might be recovered before distillation of solvent commenced. In other cases it was possible to use a high styrene/oil ratio and stop the reaction at a low styrene consumption. By such methods the styrene chain length could in some measure be regulated. Alternatively, the concentration of reactants in solvent could be varied for similar purposes and either the excess removed or the deficiency made good.

Principal Properties

From the information collected, the authors itemised the salient paint-making properties of the copolymers described: (1) Air dry rapidly to touch by solvent release; (2) after-harden in the presence of driers to films having a variety of properties; (3) low acid value and good stability towards all pigments; (3) moderate wetting properties, but excellent suspension for pigments; (5) pale colour, good colour retention, and lack of dirt retention; (6) good water resistance; (7) good electrical properties, particularly with regard to anti-tracking.

Coming to the theoretical consideration of the nature of the styrene and drying-oil radicals, the authors pointed out that the nature of the polymerisation of vinyl compounds was relatively well understood. On the other hand, copolymerisation was a process about the mechanism of which relatively little was known, even in the simplest case of the simultaneous polymerisation of two polymerisable substances, each of which would polymerise readily under the reaction conditions obtaining. The copolymerisation of styrene with drying-oil radicals below 200° C., and especially in the presence of a solvent, was a more difficult case, in that the oil component of the reaction mixture did not normally polymerise readily under the conditions of the reaction.

The course of that reaction depended primarily on the nature and the degree of polymerisation of the drying-oil component of the reaction mixture. The authors deduced from their experimental evidence a working hypothesis to account for those facts; their proposals, in the light of the progress made, were (1) Styrene polymerisation with non-conjugated unsaturated fatty acid radicals was a chain transfer process which proceeded more rapidly than the corresponding chain transfer with a relatively inert solvent such as xylol.

(2) Styrene copolymerisation with conjugated fatty-acid radicals involved propagation of the styrene chain across the conjugated system as in the styrene-butadiene reaction. In polyreactive systems chains were short and the products homogeneous.

(3) Where both types of radical were present in a molecule, the degree of conjugation in conjunction with the complexity (viscosity) would determine which process predominated and hence the compatibility of the species produced.

Covering Patents

An infinite variety of types could be produced, and in so far as novel products and processes were involved they had been covered by British, U.S., and Dominion patents pending or granted to Lewis Berger & Sons, Ltd.

The authors expressed thanks to the directors of Lewis Berger & Sons, Ltd., for permission to publish the paper; and to other members of the team who had been concerned with the project.

Bleached Lac

New British Standard

WHEN the British Standard Specification for Lac (B.S. 954) was issued, the possibility was envisaged of other specifications being prepared for special types of lac products. The British Standards Institution has now prepared a British Standard for Bleached Lac (B.S. 1284). This specification states that bleached lac shall be the bleached product of the lac insect (*Laccifer lacca*), that it shall be free from rosin (colophony), and shall not contain arsenic (As_2O_3) in excess of two parts per million.

Two grades are specified, differing in acidity, colour, chlorine content, and in certain forms of moisture. The form and condition are specified, also the sampling, freedom from foreign matter, wax-free mineral acid, acid value, solubility in cold alcohol, colour, chlorine content, and moisture. There are special clauses relating to ash (mineral water) and lead content. Appendices describe the method of test for each of the properties mentioned. Copies from the Institution, 28, Victoria Street, London, S.W.1 (2s.).

Royal Institute of Chemistry

The President's Address

AT the 68th annual meeting of the Royal Institute of Chemistry held on March 12, 1946, in the rooms of the Royal Society, the president, Professor Alexander Findlay, reported that membership of the Institute had increased by 459 to 9641 and the register of students gone up by 205 to 1411. Since the conclusion of hostilities, he said, the activities of the Institute had expanded, and the Council had reviewed almost every feature of the structure and work of the Institute to see where modifications and new developments were required. This survey had ranged from purely domestic matters, such as the constitution of the Council, to questions involving relations with such organisations as Government departments, local authorities, and universities; from educational problems such as the status and scope of National Certificates in Chemistry and the organisation of scientific courses to issues affecting the status and welfare of chemists engaged in various fields of work; and from matters long under discussion, such as the relations with the Institute of persons not qualified for admission to the Associateship, to new proposals such as the issue of a Directory of Independent Consultants. The Council had received with regret the resignation of Mr. J. C. White from the office of treasurer, which he had held throughout the war.

In his presidential address, Professor Findlay said that chemists must play an important part in the work of improving the physical and material well-being of the community. The Institute also would have to bear an increased burden of responsibility in promoting the efficiency and usefulness of all those engaged in the practice of chemistry and in securing that such conditions were established as would enable the special knowledge and experience of chemists to be used to the best advantage. In all matters of national interest in which the knowledge and experience of its members gave it a right to speak or act with authority, the Institute must be ready to give guidance. It must be more ready than it had been in the past to take the initiative.

Examination of Water

Speaking of chemists in the public health services, Professor Findlay insisted that the chemical and bacteriological examination of water must be carried out by men competent both in chemistry and in bacteriology. He issued a warning to the general public and to public authorities that diversion of the bacteriological examinations of potable water away from those who were carrying out the chemical examinations might lead to false interpretations of the results of the examinations and entail danger to the community. He held it to be a matter of importance that the Institute, probably in collaboration with other bodies, should exert itself in order to bring about, in the minds of the people as a whole, a better understanding of the nature and importance of the work of chemists and a consequent increase in the esteem in which the profession is held by the community. In the solution of the many urgent problems of reconstruction, chemists must, without any thought of domination on their part or of claiming to force decisions in matters which lay outside their special province, be admitted to full and free collaboration with those who had the responsibility of framing policy and of administering the affairs of the country. Only in this way could there be achieved that mutual appreciation and respect between the scientist and the politician which were so important for the rebuilding of the post-war world.

Professor Findlay declared Dr. Gerald Roche Lynch elected as president of the Institute for the ensuing year.

Officers and Members of Council

The following are the officers and members of Council of the Royal Institute of Chemistry for 1946-47.

President: Dr. Gerald Roche Lynch, O.B.E. *Vice-presidents*: Mr. A. L. Bacharach, Dr. H. V. A. Briscoe, Dr. William Cullen, Mr. G. E. Dodds, Professor Alexander Findlay, and Mr. A. J. Prince. *Hon. treasurer*: Dr. D. W. Kent-Jones.

Members of Council: Dr. Harry Baines, Mr. J. E. Bowen, Mr. W. G. Carey, Dr. Frederick Challenger, Mr. R. C. Chirnside, Mr. L. V. Cocks, Dr. J. W. Cook, F.R.S., Dr. Albert Coulthard, Mr. J. C. Cowap, Dr. C. J. T. Cronshaw, Dr. J. O. Cutter, Dr. J. F. J. Dippy, Dr. T. F. Dixon, Mr. M. B. Donald, Dr. H. J. Emeléus, Dr. A. E. Everest, Mr. T. H. Gant, Mr. A. T. Green, O.B.E., Professor J. M. Gulland, F.R.S., Dr. M. H. Hall, Dr. D. H. Hey, Dr. H. H. Hodgson, Mr. R. H. Jones, Mr. J. W. Kerr, Dr. J. G. King, O.B.E., Dr. G. F. Marrian, F.R.S., Mr. F. E. Needs, Dr. H. B. Nisbet, Mr. J. A. Oriel, M.C., Mr. F. T. Osborne, O.B.E., Mr. J. W. Parkes, Dr. J. H. Quastel, F.R.S., Professor E. K. Rideal, M.B.E., F.R.S., Dr. G. L. Riddell, Dr. Frank Roffey, Mr. Fred Scholefield, Dr. J. L. Simonsen, F.R.S., Mr. R. W. Sutton, Professor A. R. Todd, F.R.S., Dr. Ernest Vanstone, Mr. E. J. Vaughan, and Mr. Harry Weatherall.

Chemical Industry in Eastern Germany

Efforts to Counteract Shortages

STRENUOUS efforts have been made by the Soviet Military Administration in Eastern Germany and by the German Central Administration operating in the Russian zone, to restore industrial activity to its peace-time volume, and the reconstruction reports, published largely for propaganda reasons, show that considerable progress has been made in some industries. In general, however, war damage, the disorganisation resulting from the collapse of the Nazi war machine, and lack of transport, labour, and raw material have so hampered reconstruction that even now progress is piecemeal and largely unrelated.

Alternative Manufactures

In the chemical industry many factories were able to draw on old stocks after the collapse, and some of the smaller works and laboratories soon found limited opportunities for a resumption of their activities, though often only by producing alternative manufactures. Thus, in Berlin some 50 firms are now reported to be engaged in making pharmaceutical preparations, some of them former cosmetic makers. The demand for sera, vaccines, and similar products has risen steeply in connection with the influx of the so-called "re-settlers," *i.e.*, Germans from the East, and the production is easily and quickly absorbed.

Of the half-dozen hydrogenation plants known to exist in the Russian zone of Germany, only two have lately appeared in the news—the I.G. Farben plant at Leuna and the Brabag plant at Magdeburg. Both of these are reported in large-scale production. The Brabag plant resumed the supply of motor spirit early last November and is now producing at 50 per cent. of the previous level. By spring it was to meet all the fuel needs in its area. Of about 5000 workers employed in the plant an unspecified number is still repairing machinery. At Leuna production was resumed rather earlier, and by September progress had been so satisfactory that the output was above the supply quota previously fixed. Towards the end of the year the rate of production of motor spirit at Leuna was reported to exceed 100,000 tons per annum, and further progress has been claimed since.

In the absence of any recent news about other hydrogenation plants in Central Germany it seems likely that these are to be dismantled and transferred to the East. From Poland it was reported earlier that one of them, at Schwarzheide, was to be removed, and according to the decision of the Allied Control Council all synthetic oil plants, including those still working at Leuna and Magdeburg, are eventually to be dismantled or destroyed. At Leuna the present production programme includes several other fuels.

Production of ammonium sulphate was resumed at Leuna as early as last June. Early this year the monthly production rate exceeded 10,000 tons, and efforts for further expansion have been made since. These included the reopening of a nitrate of lime plant. The production of chemical fertilisers in general is inadequate to meet all requirements, although the potash mines and processing works as well as phosphatic fertiliser factories were ordered by Marshal Zhukov to introduce day-and-night work in three shifts. Potash is normally used in large quantities in the sugar-beet producing areas of Central Germany, where low-grade salts are usually applied. Certain quantities seem, however, to have been exported recently to Czechoslovakia, and potash also features in inter-zonal trade agreements concluded between Thuringia and Bavaria, Hesse and Hanover.

Another product sent from Thuringia to the Western zones of Germany is cell-wool made at Schwarza. This plant, which is now making cell-wool at a rate of about 50 tons a day, is expected to increase its output further. A small-scale commercial plant for making perlon, the German version of nylon, was recently put in operation after extensive trials going back several years. No news has been received from other synthetic fibre works in the Russian zone. The industry is suffering from the shortage of cellulose, chemicals, and fuel.

Shortage of Raw Materials

Shortage of fuel and raw materials is hampering in particular the bigger makers of fine chemicals and drugs, who depend on intermediates from other parts of Germany. As a result, there have been important changes in production programmes. Schering A.G. (Berlin), Behring (Marburg), Sächsische Serum-Werke (Dresden) are all working; the first-mentioned firm has begun to make penicillin and is to double its production of insulin (now 2,000,000 units a month) this year. To increase raw material supplies, systematic collection of medicinal herbs and planned cultivation of medicinal plants have been arranged, while abattoir by-products are collected for insulin makers. Several thousand tons of resins are to be obtained this summer from pine trees, and horse-chestnuts are collected for a firm making a concentrated food from them.

The virtual suspension of coal and coke shipments to Central Germany from the Ruhr and Silesia has necessitated new uses for lignite, lignite tar, and lignite briquettes.

NEW RESEARCH STATION

A view of the mansion (right) and the drive (below), forming part of the Fernhurst estate of the late Sir Felix Schuster, near Haslemere, Surrey, which has been acquired by Plant Protection, Ltd., with the purpose of developing it as a horticultural research station. Laboratories, a lecture theatre, and photographic studios will be installed in the mansion. The estate will be equipped for the evaluation and field trial of pest and disease control by chemicals which are constantly being evolved by the fundamental research undertaken by I.C.I. on behalf of Plant Protection.

Parliamentary Topics

Penicillin

IN the House of Commons last week, Mr. Kirby asked the Minister of Supply to make a statement on progress, number employed, and output at the new penicillin factory, Speke, Liverpool.

Mr Leonard: Production at this factory is at present in its initial stages and the number of people employed is 311. Output is rising steadily at a rate which is expected soon to increase when initial difficulties have been overcome and the staff is fully trained.

Polyvinyl Chloride

Mr. A. Lewis asked the President of the Board of Trade why titanium oxide and tricresyl phosphate, which are required for the production of coloured polyvinyl chloride, were being exported, on instructions from his Department, to such an extent that the manufacturers of polyvinyl chloride had no stocks available for supplying this commodity to manufacturers of extruded products using polyvinyl chloride in this country.

Sir S. Cripps: Exports of titanium oxide have been permitted to an extent agreed with the manufacturers in order to meet the needs of Empire countries. No arrangement has been made by my Department as to the level of exports of tricresyl phosphate. Inquiries are being made regarding the supply of these materials to manufacturers of coloured polyvinyl chloride and the effect of any shortage on the output of extruded products.

Uranium and Thorium

Mr. Blackburn asked the Prime Minister whether he would take steps to ensure that all quantities of uranium and thorium in the British Commonwealth and Empire were acquired by H.M. Government or by a Commonwealth or Empire Government.

The Prime Minister replied that steps had already been taken to ensure full control over the disposal of such supplies.

Scientific Manpower

Wing-Commander Millington asked the Lord President of the Council when the Report of the Scientific Manpower Commission might be expected. Mr. Herbert Morrison replied that the Committee on Scientific Manpower hoped to present a report within the next few weeks. He would give careful consideration to the question of publication.

Personal Notes

MR. F. J. TRITTON, B.Sc., A.R.I.C., has been elected president of the Royal Photographic Society of Great Britain.

MR. P. P. LEVY, who is joining the board of H. B. Barnard & Sons, Ltd., as from April 1, has had considerable experience in the non-ferrous metal trade.

MR. R. SMILES, of I.C.I. (Billingham), Ltd., has been appointed hon. secretary of the newly-formed Lanarkshire Group of the Royal Society for the Prevention of Accidents.

MR. JOHN BROWN has retired from the general secretaryship of the Iron and Steel Trades' Confederation and is succeeded by MR. LINCOLN EVANS, previously branch secretary and organiser and latterly assistant secretary.

Professor Leslie Aitchison, recently appointed to the new Chair of Industrial Metallurgy at Birmingham University, as already announced. His department will be enabled, by means of the generous gift recorded in our last issue, to start its activities immediately.

The honorary degree of LL.D. in the University of Edinburgh is to be offered by the Senatus to PROFESSOR FREDERIC JOLIOT and MADAME IRENE JOLIOT-CURIE, joint Nobel laureates. The graduation ceremonial will be held on June 28.

MR. C. G. G. BOSWOOD (hitherto secretary and general manager), MR. A. S. GILL, and MR. C. E. G. NYE have been elected to the board of George Cohen, Sons & Co., Ltd., as special directors. MR. R. S. FERRY has been appointed secretary of the company.

In addition to the "independent" members of working parties listed last week, two of the chairmen are well-known personalities in the chemical industries. MR. GEOFFREY CUNLIFFE, managing director of the British Aluminium Company, is chairman of the working party for the carpet industry; and MR. S. J. L. HARDIE, D.S.O., chairman of the British Oxygen Company, presides over the jute working party.

Among the 25 candidates recommended by the Council of the Royal Society for election to the fellowship at the meeting on March 21, the following are of especial interest to the chemical industry: DR. WILSON BAKER, Professor of Organic Chemistry at Bristol University; DR H. J. EMELEUS, Reader in Inorganic Chemistry at Cambridge; DR. E. A. GUGGENHEIM, Lecturer in Chemical Thermodynamics at University College, London; and MR. H. W. THOMPSON, University Demonstrator in Chemistry at Oxford. Professor Baker is distinguished in research on the structure of natural colouring matters; Dr. Emeléus is well known for his studies of the silicon and fluorine compounds; Dr. Guggenheim's contributions to statistical mechanics are outstanding; while Mr. Thompson has carried out remarkable work on the application of spectroscopic methods (especially infra-red) to chemical problems.

Obituary

MR. CORNELIUS MILTON BIGGART, a former director of the Western Chemical Company (Paisley), Ltd., has died in Glasgow.

MR. ALEXANDER CAMPBELL, whose death occurred in Glasgow on March 12, was chemical engineer on the staff of Ernest Scott & Co., and George Scott & Son (London), Ltd. Widely known in the chemical industry in Scotland and in the North and Midlands of England, Mr. Campbell travelled extensively abroad for the firm, which he joined in 1915. He was in his 50th year.

A number of new Data Sheets have recently been issued for the KODAK DATA BOOK OF APPLIED PHOTOGRAPHY. Sheet No. B2 (pp. 9) deals with 16-mm. cine-micrography. Slow-motion and time-lapse cinematography are discussed in relation to the microscope, and suitable apparatus, optical system, and films are described. A bibliography is included. Shtets X43 and X44 give details of Kodachrome Film (Daylight Type) and Kodachrome Film, Type A. Sheet X45 (pp. 6) discusses Kodak Photographic Papers in general terms, and then goes on to give details of some of the more important grades. Sheet X46 is concerned with Kodak P.1500 Lightning Press Pan. Plate. A new Index has been issued. It is stated that since the present ring binder is overcrowded, a second binder (Vol. 3) in the same style may now be obtained at a cost of 5s., post free, from Kodak, Ltd.

General News

From Week to Week

The first bulletin of the Standards Institution of Palestine can now be seen in the library of the British Standards Institution.

Drilling for oil has been started by engineers of the Anglo-American Oil Company at Gringley-on-the-Hill, near Doncaster, Yorkshire.

The first shipment (1200 tons) of Swedish wood-pulp to arrive in this country since 1939 has been unloaded at Watchet, Somerset, and is being distributed in the West Country.

Resumption of trade with Siam by persons in the United Kingdom is authorised by three orders recently issued under the Trading with the Enemy Act, 1939. The orders are S.R. & O's., 1946, No. 292, 293 and 294.

The telephone service with Palestine has been reopened and will be available from 8 a.m. to 11.30 a.m. and from 4 p.m. to 5.45 p.m. G.M.T. daily. The charge for a three-minute call will be £3 6s., and the report charge (where applicable) will be 6s.

An outbreak of fire at the works of the Shettleston Oil and Chemical Co., Ltd., Glasgow, last week, caused a tar storage tank to explode and sent a stream of burning tar through adjoining roadways. Sand was used to check the blaze.

The Post Office is receiving many letters from people on the Continent complaining of the forgetfulness of friends in the United Kingdom who continue to stamp their letters with the insufficient amount of 2½d. The correct postage is 3d.

A Scottish Statistical Research Bureau has been set up, it is announced, after discussions between the four Scottish universities and the Faculty of Actuaries. The secretary is Mr. E. Waugh, Faculty of Actuaries, 23 St. Andrew Square, Edinburgh.

At Chatham, Kent, last Monday, a scheme for an industrial trading estate for new industries in the Medway area was approved at a town meeting. It is reported that 45 concerns have already applied for factory sites.

A survey of the peat resources of Scotland is to be made, according to Sir Patrick Dollan, chairman of the Scottish Fuel Economy Committee. The main purpose of the survey, it is stated, is the supplementing of domestic fuel supplies.

The British Colour Council Hosiery Consultative Committee announces the issue, for 1946, of eight colours for women's stockings, in place of the four that have been in use since 1940—a welcome relief from "austerity." The colours have been chosen also to meet the needs of the export market.

Technical text-books on all subjects, including metallurgy and industrial chemistry, are urgently needed in China. British United Aid to China, 57 New Bond Street, London, W.1, will be glad to forward to the proper quarter any such volumes as can be spared.

I.C.I. (Widnes) Dramatic Society are following up their successful presentation last week of Noel Coward's comedy "Blithe Spirit" by competing in the third annual drama festival of the Widnes Society of Arts. The festival lasts from March 30 to April 6, and "Blithe Spirit" will be presented on April 1.

The Eireann Minister for Industry and Commerce has made orders permitting the raising of the weekly cost-of-living bonus in several industries, including (in the chemical industries) phosphate mining (Clare) 15s., ochre mining (Wicklow) 12s., gypsum mining (Monaghan) 16s., industrial gases (Dublin) 15s.

With the co-operation of the railway companies, the Post Office intends in May to restore seven more travelling post offices, which will enable the Post Office to give delivery by first post next day (except Sundays) anywhere in England and Wales of correspondence posted in London in time for the 4/5.30 p.m. collections.

The Mark Committee of the British Standards Institution has drawn up, in collaboration with the British Plastics Federation, a certification scheme applicable to plastic materials and to products made of plastics. This mark may be used under licence from the B.S.I. by manufacturers of plastic materials which conform to a B.S. specification.

Exporters who wish to send goods to Holland are advised by the Board of Trade that it is no longer necessary to make shipping arrangements through the Netherlands Office for Relief and Rehabilitation, and they may contact their normal shipping agents in the usual way. Traders should satisfy themselves that import licenses have been issued by the Dutch authorities before effecting shipments.

It is reported in the *Scotsman* that a factory for the manufacture of penicillin may be established at Hillington, Glasgow, if a licence can be obtained from the Ministry of Supply. The new enterprise is said to be sponsored by the Heyden Corporation of New York, and the amount to be spent on it is in the nature of £625,000. It is stated that equipment for the factory, which would employ 900 men and 100 women, is ready for shipment from the U.S.A.

The Trade Agreement concluded between the United Kingdom and Argentina on December 1, 1936, was due to expire on February 21, 1946, in view of the six months' notice of termination given by the Argentine Government on August 21 last. It has, however, now been arranged that the agreement should be regarded as remaining in force for a further period of six months in the form of a gentlemen's agreement.

A warning against any light adventuring into the plastic industries was given last week by Mr. H. V. Potter, managing director of Bakelite, Ltd., addressing Edinburgh City Business Club. The magic word "plastics," he said, had caused inflated Stock Exchange quotations and a great deal of mis-statement. There were definite possibilities in the industry, but they were limited by the availability of raw materials.

A new edition of the D.S.I.R. booklet, "Tests on Volumetric Glassware," has been issued by the Metrology Division of the National Physical Laboratory. It contains particulars of the regulations covering tests of laboratory glassware in Class A (highest accuracy) and Class B (good commercial quality) and of verification fees and other charges. Copies may be obtained by readers of THE CHEMICAL AGE from the Director of the N.P.L., Teddington, Middlesex.

Wrexham and South Lancashire are the areas chosen by the Government for development in the first place under the new Distribution of Industry (Development Areas) Order. Heavy unemployment has begun to appear in both areas, especially with women in the Denbighshire area since the closing of the R.O.F. at Marchwiel. It is proposed to develop this extensive factory as a branch of the South Wales Trading Estate, and the Board of Trade hopes to induce industrialists to go both there and to the Wigan-St. Helens area.

Fibre glass made into curtains, fabrics, tablecloths, etc., was displayed at an exhibition which opened at St. Helens, last week. Mr. G. L. Pilkington, chairman of Messrs. Pilkington Bros., stated at the opening that the manufacture of fibre glass had been started at St. Helens as well as Glasgow. Professor H. Moore, who occupies the chair in glass technology at Sheffield University, and was formerly associated with Pilkington Bros., said Britain had been saved by the fact that here and nowhere else had been a glass which, combined with electrical knowledge and science, produced radar parts.

On April 6 next, the practices of Mactaggart and Evans, consulting chemical engineers, 14 Old Queen Street, London S.W.1, and of Murray, Bull and Spencer, Ltd., consulting and research chemists, 20 Kinnerton Street, London, S.W.1, will be amalgamated. The title of the latter company will be changed to Murray, Mactaggart and Co., Ltd., consulting technologists, and Mr. E. F. Mactaggart will join the Board as joint managing director with Mr. H. D. Murray. Invoices and accounts for the new company should be sent to 20 Kinnerton Street.

Foreign News

An attempt is being made to develop the sulphur mines at Mersa Fatma, south of Massowa, Eritrea.

Oil exploitation in French Equatorial Africa is reported to be developing satisfactorily. Output in Gaboon amounts to about 500 litres of crude oil daily.

The Portuguese export duties on metallic tin, tin and tungsten ores and residues have been revised and reduced by an order of the Minister of Economy.

According to a declaration of the Ministry of Health and Hygiene, the manufacture of penicillin will be started in Italy on an industrial basis.

Brazil's imports of soda ash during the first eight months of 1945 amounted to 20,496 metric tons; caustic soda imports totalled 19,619 tons; sodium bicarbonate, 3070 tons; and calcium superphosphate, 8754 metric tons.

The British military Government in Germany has confiscated the assets of the three most important companies forming the Vereinigte Stahlwerke, one of the chief combines in Germany's heavy industry. The companies concerned are the August Thyssen Foundry in Duisburg-Hamborn, the Eisenwerke A.G. in Mühlheim, and the Röhrenwerke A.G. in Düsseldorf.

The provision of multi-vitamin tablets to the Chinese students who are being transported back to their homes from four of the five Christian universities where they have been working during the war, is recommended by Miss Pearl Chien, head social welfare officer of the West China University. Many of them had contracted tuberculosis on the arduous journey to the interior of China, and it will again be difficult for them to get adequate food on the return voyage.

Preliminary reports from official channels indicate that there are stocks of about 1200 and 1300 tons of tin concentrates in Lower Burma. The Ministry of Supply has appointed Mr. A. P. Ruddy, chairman of the officially-appointed Mining Inspection Committee nominated by the Lower Burma tin and wolfram mining industry, to survey and report on conditions and requirements of mining properties, to be its agent, to take over stocks of tin metal and ore, and to report on the general conditions and prospects of the Lower Burma tin and mining industry.

Forthcoming Events

March 25. Association of Austrian Engineers, etc. Institution of Mechanical Engineers, Storey's Gate, London, S.W.1, 7 p.m. Prof. G. Schlesinger: "Japan's Industries."

March 25. Electrodepositors' Technical Society. Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London, W.C.2, 5.30 p.m. Mr. C. Frenkel: "Continuous Electrotinning of Steel Strip in the Manufacture of Tinplate." Mr. P. F. Grove: "Electrical Equipment for Continuous Strip Electrotinning Lines."

March 26. Royal Institution. 21 Albemarle Street, London, W.1, 5.15 p.m. Sir Lawrence Bragg: "The Atomic Structure of Minerals—II."

March 26. Institute of Fuel. Royal Geographical Society, Exhibition Road, Kensington, 6 p.m. Cinematograph film: "Steam."

March 27. Institute of Welding. Institution of Civil Engineers, Great George Street, Westminster, S.W.1, 5.30 p.m. Mr. E. Seymour Semper, Mr. L. J. Hancock: "Plate Edge Preparation for Welding by Oxygen Cutting and Gouging."

March 27 and **28. Federation of British Industries.** Conference on industry and research, Kingsway Hall, Kingsway, London, W.C.2. March 27, 10.30 a.m., Sir Robert Robinson: opening address; Sir William Larke, Sir Edward Appleton, Sir Harold Hartley, Sir Ernest Simon: "Science, Industry and the Community"; 2.15 p.m., Dr. J. R. Hosking, Mr. A. Healey, Dr. C. C. Paterson: "Scientific Research and Production." March 28, 10 a.m., Mr. Herbert Morrison, address; Dr. R. E. Slade, Mr. C. H. Davy, Mr. A. J. Philpot: "Scientific Research and Industrial Expansion"; 2.15 p.m., Sir John Anderson: address; Dr. P. Dunsheath, Sir Raymond Streat: "The Application of Research in Industry."

March 28. Association for Scientific Photography. Caxton Hall, Westminster, London, S.W.1, 6.30 p.m. Mr. C. W. Bunn: "Towards Atomic Photography."

March 28. Royal Institution. 21 Albemarle Street, London, W.1, 5.15 p.m. Dr. H. Fröhlich: "Theoretical Physics in Industry—I."

March 28. Institute of Fuel (Midland Section). James Watt Memorial Institute, Birmingham, 2.30 p.m. Mr. W. A. Moorshead: "Waste Heat Recovery in the Glass Industry."

March 28 and **29. British Ceramic Society** (Refractory Materials Section). Spring meeting, Royal Technical College, Glasgow, C.1. March 28, 10 a.m., E. H. M. Badger, W. Lewcock, J. H. Wylde: "The Influence of the Glassy Bond on Some Properties of Silica Refractories"; 12.45 p.m., informal lunch (Grosvenor Restaurant, Gordon Street); 2.30 p.m., Dr. J. H. Chesters: "Refractories—the Limiting Factor in Open-Hearth Design." March 29, 9.45 a.m., Council meeting; 10.15 a.m., general business; 10.30 a.m., "Experiences of the Team which has Visited Germany and Austria to Investigate Refractories Plants."

March 29. Institute of Fuel (Scottish Section). Royal Technical College, Glasgow, 5.45 p.m. Mr. Oliver Lyle: "Inefficiency."

March 29. Oil and Colour Chemists' Association (Bristol Section). Grand Hotel, Broad Street, Bristol, 1, 6.15 p.m. Mr. G. A. Campbell: "The Pre-treatment of Pigments."

March 29. British Association of Chemists (Slough Branch). Public Library, William Street, Slough, 6.30 p.m. Dr. A. E. Dunstan: "Petroleum—a Source of Synthetic Materials"; cinematograph film: "Bouncing Molecules."

April 1. Society of Chemical Industry (London Section). The Chemical Society's Rooms, Burlington House, Piccadilly, W.1, 6.15 p.m. Dr. L. P. Walls: "A New Advance in Chemotherapy."

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

JAMES BEADEL & CO., LTD., Liverpool, chemical and general merchants. (M., 23/3/46.) February 27, equitable mortgage, to Martins Bank, Ltd., securing all moneys due or to become due to the Bank; charged on 39 Richmond Hill Road, Edgbaston, Birmingham. *—. April 2, 1945.

CLAY & SON, LTD., London, E., dealers in manures and horticultural sundries. (M., 23/3/46.) February 22, mortgage to Midland Bank, Ltd., securing all moneys due or to become due to the Bank; charged on Manor Nurseries, Steele Cross, Crowborough, and land in rear thereof together with fixtures. *£850. September 10, 1943.

W. F. METCALF, LTD., Southport, chemical manufacturers, etc. (M., 23/3/46.) February 21, debenture, to Stowe Trust, Ltd., securing the balance which on every account shall for the time being be owing to the holders; general charge. £8672 (Bankers). December 31, 1943.

Company News

British Aluminium Co. reports net profit of £1,019,444 for 1945 (£1,049,257). The final dividend on ordinary stock will be 6 per cent., making the total distribution 8 per cent. (10 per cent.).

Bradford Dyers' Association, Ltd., report net profit of £227,565 for 1945. After payment of debenture interest and preference dividend, and placing £50,000 to general reserve (same), the directors again recommend ordinary dividend of 5 per cent.

Yorkshire Indigo, Scarlet & Colour Dyers, Ltd., report income for 1945 totalling £15,240 (£16,080), net profit being £3734 (£3730). Dividend of 10 per cent. on 5 per cent. preference shares for two years to December 31 last (same to 1943).

Blythe Colour Works, Ltd., report that profit for 1945 was the highest in the company's history, totalling £84,200, as against £56,393 for 1944 and £25,762 for 1943. The ordinary dividend is raised from 30 per cent. to 50 per cent., and there will be a victory bonus of 15 per cent.

New Companies Registered

Jays (Chemists' Sundries), Ltd. (406,160). Private company. Capital £10,000 in £1 shares. Manufacturing chemists, etc. Directors: G. Jay, J. S. Jay. Registered office: 32 Houndsditch, E.C.3.

Lenk's Chemical Products, Ltd. (406,164). Private company. Capital £2000 in £1 shares. Manufacturers of and dealers in chemicals, etc. Subscribers: E. A. Morgan, J. Simmonds. Solicitors: Athan Morgan & Shibko, Cardiff.

John E. Moore, Ltd. (405,802).—Private company. Capital, £10,000 in £1 shares. Metallurgists, iron and brass founders, manufacturing chemists, etc. Subscribers: Jno. E. Moore; Jos. E. Moore. Registered office: Lakeside Works, Yeadon, nr. Leeds.

Plastic Fancy Goods (Halifax), Ltd. (406,286).—Private company. Capital £2000 in £1 shares. Manufacturers, producers and moulders of plastics, etc. G. J. M. Turner signs as director. Registered office: Oldham Road, Ripponden, near Halifax.

Blackpool Fine Plastics, Ltd. (405,944).—Private company. Capital £1000 in £1 shares. Manufacturers of and dealers in plastics, chemicals, etc. Directors: J. W. Kendall, A. Kendall, A. Bull. Registered office: 2 Merelands Road, Marten, Blackpool.

Chemical and Allied Stocks and Shares

HOPES and fears regarding international affairs have been predominant in stock markets, where values have declined on balance, although more reassuring views caused a partial recovery in most sections. British Funds rallied well after a sharp decline, although the view has gained ground that the expected big new Government loan is unlikely to make its appearance until after the Budget, and market conditions for the time being have an unsettled appearance. Industrials also made some recovery, sentiment reflecting the dividend increases and victory bonuses which continue to feature company announcements. It is generally felt that other important announcements due shortly and later in the year will also show some modification of the very conservative policy in regard to dividends followed during the war years. Hopes persist that the Budget will bring reduction in taxation, although there is now talk that if E.P.T. is abolished it may be replaced by new legislation designed to limit dividend payments. The market continues to be impressed by the higher profits and dividends which feature results of stores companies, although it is clear that during the past years special factors favoured this class of business.

Imperial Chemical at 40s. were slightly lower on balance and now yield 4 per cent. with general expectations that there are good prospects of the 8 per cent. dividend basis of recent years being maintained. Turner & Newall at 82s. 3d., were also lower on balance, as were Lever & Unilever at 50s., Distillers at 116s. 6d. Dunlop Rubber remained firm at 54s., aided by market talk of higher dividend possibilities. B. Laporte kept around 84s., and Fisons became more active and were dealt in up to 56s. In other directions, William Blythe 3s. ordinary further strengthened to 13s. 3d. on hopes that the results due in a few weeks may show a further increase in the distribution on the shares. Burt Boulton have changed hands at 25s., and there was again a fair amount of activity around 58s. in British Drug Houses, reflecting continued market talk that an offer of additional shares to shareholders on favourable terms may be in prospect. W. J. Bush at 85s., remained firm on higher dividend prospects and the company's good record over a long period. Monsanto Chemicals 5½ per cent. preference were again 23s. and Morgan Crucible 5 per cent. preference changed hands at 25s. 6d. De La Rue showed activity at £10¼, British Industrial Plastics 2s. shares were 7s. 3d., and Erinoid 5s. ordinary 13s.

Movements in the iron and steel section have been mostly small; sentiment was affected by the lower dividend announced by Hadfields. The 10s. units of the latter

moved down to 29s. 6d. After earlier declines, Babcock & Wilcox rallied to 59s. 6d., Dorman Long to 25s. 6d., Guest Keen to 42s. 7½d., Staveley to 42s. 3d., Stewarts & Lloyds to 55s. 9d., and United Steel to 24s. Bradford Dyers at 25s. 9d.xd were steady among textiles on the results, the dividend again being 5 per cent. with a further £50,000 placed to reserve. Courtaulds were 53s. 9d.xd, and Calico Printers rose to 22s., sentiment in regard to the latter reflecting hopes that dividends may be resumed later in the year. Oils continued uncertain, but, following a further decline, Anglo-Iranian showed a sharp rally to 93s. 1½d. Moderate declines were recorded by Shell and Burmah Oil.

British Chemical Prices

Market Reports

A MODERATE volume of new business has been reported on the London general chemicals market during the past week and the position generally remains much the same as reported last week, with prices unchanged and steady at recent levels. Deliveries against existing contracts appear to be well up to schedule. A fair amount of inquiry is in evidence for hyposulphite of soda, bichromate of soda, chlorate of soda, and caustic soda. The potash chemicals generally are displaying a strong undertone and a persistent demand is reported for permanganate of potash. In other directions white powdered arsenic is in good demand and formaldehyde continues in steady request. In the coal-tar products market conditions are active and values firm with spot offers scarce.

MANCHESTER.—A steady demand for deliveries against contracts of textile and allied chemicals has been reported, and replacement buying by the cotton and woollen mills and other users has been a regular feature. Caustic soda, bleaching powder and other heavy chemicals have been the subject of fresh inquiries on export account and any easing of the shipping position will probably be accompanied by a further expansion of overseas business. Most of the fertiliser materials are moving steadily to the consuming end. In the by-products market pretty well all the heavy materials are active, and a steady trade is passing in benzol and certain other light distillates.

GLASGOW.—All grades of light and heavy chemicals showed activity during the past week. The home trade showed a normal demand for standard materials, with prices remaining firm. Export inquiries continue to arrive in great quantities and the number of orders received has been very satisfactory, but there is a continuing shortage of supplies in almost all materials, particularly in home-produced fillers and extenders in the paint and rubber trades.

EDUCATIONAL

IMPERIAL COLLEGE OF SCIENCE AND TECHNOLOGY.

Physics Department (Technical Optics Section)

A COURSE OF SIX LECTURES
by
B. K. JOHNSON, D.I.C.,
on
MICROSCOPY
will be given on Tuesdays and Thursdays at 4 p.m., commencing on Thursday, 25th. April, 1946.

An optional course of practical work (consisting of eight periods of three hours each) will be arranged during the eight weeks commencing 20th May, at times to suit those wishing to attend. These courses will be suitable for those having to use the microscope in technical practice; they will include advanced methods in microscopy, and ultra-violet microscopy.

Application for admission should be made to the Registrar of the Imperial College, Prince Consort Road, S.W.7.

Great Possibilities for QUALIFIED CHEMICAL ENGINEERS

VAST and far-reaching developments in the range of peacetime productions and markets of the Chemical Industry mean that the profession of Chemical Engineering will be of great importance in the future and one which will offer the ambitious man a career of outstanding interest and high status. The T.I.G.B. offers a first-class training to candidates for the Chemical Engineering profession.

Enrol with the T.I.G.B. for the A.M.I.Chem.E. Examinations in which home-study students of the T.I.G.B. have gained a record total of passes including—

THREE "MACNAB" PASSES
and
THREE FIRST PLACES

Write to-day for the "Engineers' Guide to Success"—free—containing the world's widest choice of Engineering courses—over 200—the Department of Chemical Technology, including Chemical Engineering Processes, Plant Construction, Works Design and Operation, and Organisation and Management—and which alone gives the Regulations for A.M.I.Chem.E., A.M.I.Mech.E., A.M.I.E.E., C. & G., B.Sc., etc.

THE TECHNOLOGICAL INSTITUTE OF GREAT BRITAIN
219, Temple Bar House, London, E.C.4

SITUATIONS VACANT

DYESTUFFS INTERMEDIATES: PLANT MANAGER REQUIRED. Salary £750 to £1000 p.a. according to experience and qualifications. Athole G. Allen (Stockton) Ltd., Stockton-on-Tees, Co. Durham.

GENTLEMAN, with good knowledge of Fine and Heavy Chemicals wanted to work on own initiative within framework of already existing connection. Good salary and good prospects for later participation. Box No. 2273, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

HEAD of Research Department required by manufacturers of heavy chemicals. Essential qualifications are:—1st Class Degree (D.Sc. preferred), some years research and administrative experience in industry, proved ability to lead a research department and to plan and supervise its work. The position carries a generous salary and there are good prospects of promotion. Age 33/40 years. Brief particulars to Box No. 2278, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

REQUIRED immediately. Plant Supervisor with up-to-date experience of Copper Sulphate manufacture N.E. coast, fully conversant with all raw materials. Write Box No. 2276, THE CHEMICAL AGE, 154, Fleet Steet, London, E.C.4.

MISCELLANEOUS

WELL-KNOWN Italian industrialist with large connections desires to represent important British manufacturers of exporters of chemical products and machinery. Dr. Massimo Treves, Via Carlo Alberto, 31, Torino.

SITUATION WANTED

CHEMIST (40), British, single, seeks permanency in organic laboratory process, research or control. Provinces and nightwork considered. Write Box No. 2274, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

FOR SALE

VERTICAL Cast Iron Steam-Jacketed Pressure **FILTER** with body 28 in. dia. by 10 in. deep, fitted with perforated filter trays and cloths, vertical type with cover secured by eight quick acting swing bolts and suspended by davit; hand-wheel tensioning gear.

36-in. size. Turbine-Driven Centrifugal **FAT EXTRACTOR** with mild steel perforated case 36 in. dia. by 14 in. deep, by 1wel; mild steel monitor casing.

Vertical **EVAPORATOR** with cast iron calandrial portion 3 ft. 9 in. dia. by 3 ft. 4 in. deep; containing 326 1¾ in. dia. tubes and 10-in. centre return tube, vapour portion of riveted copper ¼ in. thick, 3 ft. 9 in. dia. by 6 ft. 6 in. on the straight, with dome cover, terminating in vapour trap 2 ft. 6 in. dia. by 3 ft. deep; complete with marine-type condenser, cast iron casing containing 254 ¾-in. tubes 7 ft. long.

Vertical All Copper, direct-fired **STILL** with steel body 2 ft. dia. by 2 ft. 9 in. deep; bolted on dome cover with 6-in. flange vapour connection with copper swan neck, tapering to 2 in. dia. coil condenser; jacket between copper lining and outer steel casing, suitable for oil.

Copper Steam Jacketed **STILL** by John Dore, 3 ft. 3 in. dia. by 5 ft. deep by ¼ in. thick, copper construction, dome top with dished bottom; 10 in. dia. opening in side, bronze cover fitted with quick-locking bolts; gauge glass; interior fitted with agitating gear of 2-bow type, agitators on horizontal shaft 1⅞ in. dia. Belt driven, fitted with copper swan neck.

Copper **STILL** in two sections, 9 ft. deep overall, by 2 ft. 8¼ in. internal diameter; detachable phosphor-bronze inspection cover 17¾ in. dia. on top portion, secured by three ¾ in. dia. quick-acting swing bolts; bottom section 1 ft. 6 in. deep, secured by heavy phosphor-bronze locking ring and six ⅞ in. dia. locking swing bolts; 1 in. dia. nest of copper steam coil in bottom, covered with perforated copper plate, complete with bolted tubular copper condenser.

Steam-Jacketed Copper **STILL** by John Dore, 3 ft. 4 in. deep on straight by 3 ft. 6 in. dia. with bolted on dome cover, arranged with two 3½ in. inspection covers. Bottom portion dished and steam-jacketed, still complete with copper swan neck, tapering to 1 in. dia. from 4½ in.; complete with aluminium coil condenser, mounted in steel tank.

GEORGE COHEN SONS & CO., LTD.
STANNINGLEY, near LEEDS
and SUNBEAM ROAD, PARK ROYAL, LONDON, N.W.10

CHARCOAL, ANIMAL, and VEGETABLE, horticultural, burning, filtering, disinfecting, medicinal, insulating; also lumps ground and granulated; established 1830; contractors to H.M. Government.—THOS. HILL-JONES, LTD., "Invicta" Mills, Bow Common Lane, London, E. Telegrams, "Hill-Jones, Bochurch, London." Telephone: 3285 East.

EGG-ENDED Riveted Cylindrical Tank to hold 11,000 gallons: Also welded Tank 20 ft. × 9 ft. × 5 ft. to hold 5500 gallons Oil: 2, Aluminium Jacketed Pans to hold 50 gallons, tested 80 lbs. Box No. 2275, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

JACKETED PANS 1 Copper 36 in. dia. by 36 in. deep.
1 C.I. 36 in. dia. by 36 in. deep.
1 M.S. 48 in. dia. by 36 in. deep
THOMPSON & SON (MILLWALL), LTD.,
60, HATCHAM ROAD, OLD KENT ROAD, S.E.15.

1000 STRONG NEW WATERPROOF APRONS. To-day's value 5s. each. Clearing at 30s. dozen. Also large quantity Filter Cloths, cheap. Wilcons, Springfield Mills Preston, Lancs. Phone 2198.

FOR SALE

100 HYDRO EXTRACTORS by leading makers from 18 in. upwards, with Safety Covers. Jacketted Steam Copper and Iron Pans. Calorifiers. Washing Machines—Gilled Pipes, etc. List sent on request. Randalls, Engineers, Barnes. Tel.: Riv. 2436. 'Phone 98 Staines.

250 and 500 Gall. Aluminium Tanks: 500 Gall. Copper Still and Condenser; Single Effect Evaporator and Condenser; 6 ft. Cast Iron Edge Runner. Vacuum Mixer 4 ft. by 3 ft. by 3 ft. 6 in. C.I. Jacketed Tipping Pan 40 galls.

HARRY H. GARDAM & CO. LTD, STAINES

SERVICING

GRINDING, Drying, Screening and Grading of materials undertaken for the trade. Also Suppliers of Ground Silica and Fillers, etc. JAMES KENT, LTD., Millers, Fenton, Staffordshire. Telegrams: Kenmill, Stoke-on-Trent. Telephone: 4253 and 4254, Stoke-on-Trent (2 lines).

GRINDING of every description of chemical and other materials for the trade with improved mills.—THOS. HILL-JONES, LTD., "Invicta" Mills, Bow Common Lane, London, E. Telegrams: "Hill-Jones, Bochurch, London." Telephone: 3285 East

MONOMARKS. Permanent London address. Letters redirected. Confidential. 5s. p.a. Royal patronage. Write Monomark BM/MONO3C, W.C.1.

PULVERISING and grading of raw materials. DOHM LTD., 167, Victoria Street, London, S.W.1.

WANTED

FOOD Manufacturers require 5-cwt. per month of Bush Non-Speck Yellow Colour Powder "H.5208." Price to Box No. 2279, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

MANGROVE EXTRACT (Borneo Cutch) wanted. Cwt. packages. State quantity, price and markings. Box No. 2266, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

WANTED.—Supplies of Nitre Cake in ten-ton lots. Box No. 2126, THE CHEMICAL AGE, 154, Fleet Street E.C.4.

AUCTIONEERS, VALUERS, Etc.

EDWARD RUSHTON, SON AND KENYON (Established 1855).

Auctioneers' Valuers and Fire Loss Assessors of CHEMICAL WORKS, PLANT AND MACHINERY,

York House, 12 York Street, Manchester.

Telephone: 1937 (2 lines) Central, Manchester

CHEMICAL LEADWORK

TANKS — VATS — COILS — PIPEWORK

W. G. JENKINSON, Ltd. Telephone 22473

156-160, ARUNDEL STREET, SHEFFIELD

TRIBASIC PHOSPHATE OF SODA

Free Running White Powder

Price and sample on application to:

PERRY & HOPE, LIMITED, Nitshill, Glasgow

Specialists in

Carboys, Demijohns, Winchesters

JOHN KILNER & SONS (1927) LTD.

Tel. WAKEFIELD 2042 *Established 1867*

The NOTTINGHAM THERMOMETER CO. LTD.

PYROMETRIC EQUIPMENT

INDICATORS—Wall Type, Portable, Multi-point, Panel Mounting.
THERMO-COUPLES—Base & Rare Metals.
RESISTANCE THERMOMETERS.
COMPENSATING CABLES.
SHEATHS—Refractory, Steel, Alloy, etc.
SPARES—Wires, Elements, Insulators, Thermo-Couple Heads, etc., etc.

THERMOMETERS

GLASS STEM DIVIDED—Ranges up to 550° C. or 1,000° F.
GLASS IN VARIOUS METAL FITTINGS—Pipe Type, Jam, Varnish, Molten Metal, Quenching Bath, Bakers, Dyers, Flue Gas, etc.
DIAL VAPOUR PRESSURE — Flexible Capillary and Rigid Stem Patterns, etc

MANSFIELD ROAD
NOTTINGHAM, ENGLAND
Phone: 45815

ESTABLISHED 1840

DANKS OF NETHERTON LTD

CHEMICAL PLANT
PRESSURE VESSELS
JACKETTED PANS
MIXERS RECEIVERS

ALL TYPES OF WELDED AND RIVETED STEEL FABRICATIONS

NETHERTON, DUDLEY, WORCS.

LONDON OFFICE—
329, HIGH HOLBORN, LONDON, W.C.1

Printed in Great Britain by THE PRESS AT COOMBELANDS, London and Addlestone, and published by BENN BROTHERS, LTD., at Bouverie House, 154, Fleet Street, E.C.4, March 23rd, 1946. Entered as Second Class Matter at the New York, U.S.A., Post Office.